FROM ENGINEER TO ENGINEERING MANAGER: A QUALITATIVE STUDY OF EXPERIENCES, CHALLENGES, AND INDIVIDUAL TRANSITIONS FOR ENGINEERING MANAGERS IN AEROSPACE COMPANIES

A Thesis in
Workforce Education and Development

by

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Submitted in Partial Fulfillment of the Requirements for the Degree of
Doctor of Philosophy
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We approve the thesis of Chris Allen Howard

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The purpose of this study was to explore the experiences and challenges faced by engineers as they moved to the position of engineering manager. Little research-based information was available to understand the challenges faced in this transition. Information was collected via qualitative interviews in the tradition of phenomenology. The phenomenon explored was the transition of engineers moving into engineering management with an emphasis on common experiences and challenges. Three interviews were conducted with five engineering managers. Each interview lasted approximately 75 minutes and was recorded and transcribed. The managers worked for aerospace companies on Long Island New York. Three research questions provided the framework for analyzing and presenting the results. Study findings included 45 experiences identified by the managers. The experiences were grouped into 9 themes. The experiences and themes were presented to the managers, who validated them and ranked the themes according to difficulty. Three themes were considered the most difficult aspects of the transition. These aspects were: (1) So much going on: The engineering manager role involves balancing many more responsibilities, tasks and priorities than the engineering role; (2) Relationship changes: Personal relationships, interaction dynamics and engineer perceptions of you have changed; and (3) Delegation: The challenge of leaving the hands on technical behind and learning to work through others. The remaining themes, while not identified as the most challenging, were still considered difficult by some or all of the managers.
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CHAPTER 1

Introduction

This chapter introduces the topic of this research study. Background information leading to the identification of the problem is discussed, followed by description of the rationale for the study, including an overview of the theoretical perspective of the research methodology. The research questions are identified, followed by information on study limitations and important definitions.

Background of the Problem

Engineering management is an important subset of the overall field of management. The management of engineers became a unique discipline after World War II (Kharbanda & Stallworthy, 1990). The first indications of this movement were the creation of professional societies. The Institute of Electronics and Electrical Engineers formed the Engineering Management Society around 1950. In 1972 the American Society for Engineering Education formed the Engineering Management Division. And in 1979 the American Society for Engineering Management was formed.

In addition to the creation of professional societies, the following periodicals focus on the unique nature of the management of engineers: (1) Transactions of Engineering Management, (2) Engineering Management Review, (3) Engineering & Management Review, (4) Research & Development Management, and (5) Research Management. The professional societies and publications dedicated to the subject of
engineering management demonstrate that engineering management is a unique field of study and interest.

Engineering management receives specific focus as a field of study for two important reasons. First, engineers are a unique subset of the workforce and managing them is different from managing other workers (Badawy, 1993; Tingstad, 1992). Second, “the engineering profession has spawned and continues to generate an era of technological creativity” (Badawy, 1995, p. 51). Effective engineering management is important for success in technological industries.

The Problem

In the following quote, Badawy (1995) used the term technologist to refer to engineers and scientists. “Successful preparation and transformation of technologists into managers is one of the most formidable tasks and challenges facing management in the twenty-first century” (p. 4). The transition of engineers into management roles has been recognized as a problem area for many years (Badawy, 1995; Lewey & Davis, 1987; Rosenbaum, 1991; Thamhain, 1992). Thamhain (1991) indicated that according to a survey he administered, “85 percent of engineering managers considered the development of new engineering-management talent crucial to the survival and growth of their businesses” (p. 66). The development of engineering managers is important, but those who go through it consider it a difficult transition. In the literature many anecdotal examples reveal why it is difficult (Alpert, 1992; Badawy, 1995; Lewey, 1987; Medcof, 1985). Authors also provide reasons why the transition is difficult. According to an example from Badawy (1995), the skills required to be an effective engineering manager
are different from those required to be an effective engineer. The engineer must use these new skills to succeed in the managerial role. Unfortunately, the sources of the difficulty in the transition are not supported by research. Little research has been done into the nature of the transition and why engineers find it difficult to make the transition into management. Hill (1993) showed that this lack of research is not limited to engineering management when she said: “Few systematic or rigorous studies had been done on the transition to management” (p. 305). Part of the problem appears to be that the transition is often treated “as an event rather than a process [and researchers usually] ignored the more person-centered aspects of the transition” (Hill, 1993, p. 306). This leads to another issue: claims in the literature that the transition from engineer to manager is difficult that are not back up by research. In addition, the reasons for the difficulty in the transition are not understood.

Rationale for the Study

This study examined the transition from engineer to engineering manager for selected managers in aerospace companies on Long Island, New York. To understand what was challenging about the transition, it was important to understand what engineers personally experienced during the transition. The experiences of these engineers could provide valuable insight into the nature of the transition. Increased understanding of the transition and the experiences could provide a foundation for beginning to identify how to lessen the transition’s difficulty. This might facilitate better transitions and better training and development efforts targeting management development for engineers. It may also provide a basis for further research based upon the findings of this study.
Overview of the Theoretical Perspective

This study was based on qualitative interviews in the tradition of phenomenology. The focus of this perspective is on the structure and essence of an experience, or phenomenon (Patton, 1990). People experience the phenomenon. The phenomenological approach is a qualitative perspective that explores the experiences of individuals in the attempt to better understand the phenomenon. This type of research provides information that is rich with detail and depth. Through interviewing, participants are encouraged to provide narrative explanations. The narrative supplies insight into what individuals experience and how they feel about the experience. In analyzing multiple interviews the researcher identifies common themes. Those themes, in turn, can serve to highlight important issues shared by those interviewed for the study.

Principles of the critical incident technique were used within the context of the phenomenological perspective (Flanagan, 1954). The critical incident technique focuses on identifying the most critical element(s) of an activity or experience. During the pilot study, the participant found the critical incident questions easier to answer and considered them the most valid. The critical incident questions were part of the interview guide.

The phenomenon examined in this study was the transition of engineers in aerospace companies into engineering management. The experiences of the managers during the transition were gathered using interviews conducted with an interview guide. The research questions of the study are presented next.
Research Objective and Questions

The chief objective of this study was to understand what is challenging about the transition from engineer to engineering manager. To achieve this objective, the nature of the transition for the managers in the study was examined in terms of the following research questions.

1. What is the job-related context of the managers during the transition from engineer to engineering manager? Specifically, what are the managerial job functions, career progression, likes and dislikes about their engineering and manager roles, and the timing and duration of the transition, in order to understand the context for the experiences and challenges explored in questions two and three?

2. What experiences are common for engineers transitioning into management?

3. What did engineering managers find most difficult about the transition from engineer to engineering manager?

The questions listed above were generated from a review of findings from past research and the literature on engineering management development (Badawy, 1995; Blano, 1996; Shenhar & Thamhain, 1994; Thamhain, 1992). In addition, a pilot study was conducted that helped to clarify the specific issues to focus on. Now each question will be discussed in turn.

Question 1: What is the job-related context of the managers during the transition from engineer to engineering manager? Specifically, what are the managerial job functions, career progression, likes and dislikes about their engineering and manager roles, and the timing and duration of the transition, in order to understand the context for
the experiences and challenges explored in questions 2 and 3? This question provides important background information for understanding the challenges.

Question 2: What experiences are common for engineers transitioning into management? It is important to understand what the engineers experienced during the transition to engineering managers. Identifying the common experiences should enable future researchers to look in more detail at any experiences that are outside the normal experience.

Question 3: What did engineering managers find most difficult about the transition from engineer to engineering manager? Answering this question provides key insight regarding the transition. A clear understanding of the challenges experienced in the transition should provide essential input for anyone involved with management development of engineers and engineering managers. It should also provide a foundation for further research into the transition and related areas.

Limitations

The study was focused on engineers in aerospace companies on Long Island, New York. While this group of engineers was an important part of the engineering workforce, they were only a subset of this group, limited to a geographic area and industry. The findings may not be accurate for other engineering groups or locations. In addition, limitations are associated with the study’s methodology. Additional limitations are discussed in chapter 3.
Definitions

It is important to understand how words were used in this study. A few key words are defined below. These words are manager, engineer, and transition. The definitions for manager and engineer are based on the definitions from the *Dictionary of Occupational Titles* (DOT). The researcher recognized that “the DOT is being replaced by the O*NET Database, which is accessible through O*NET OnLine.” (US Department of Labor, O*NET). However, the format and style of the DOT definitions were more succinct and believed to be more effective for the purpose of defining the terms.

Manager

The term manager in this study was used interchangeably with the term engineering manager. The DOT used the term supervisor, with the term manager as an alternative title. For this study the term manager used the following definition.

*Supervises and coordinates activities of workers* [italics added] … estimates *worker-hour requirements* [italics added] for completion of job assignment…. *assigns duties* [italics added].… analyzes and *resolves work problems* [italics added], or assists workers in solving work problems. Initiates or suggests plans to *motivate workers* [italics added] to achieve work goals. Recommends or initiates *personnel actions* [italics added], such as promotions, transfers, discharges, and disciplinary measures. May train new workers. Maintains time and productions records…. May confer with other SUPERVISORS (any industry) to *coordinate* [italics added] activities of individual departments.… When supervising workers engaged chiefly in one occupation or craft, is
required to be adept in the activities of the workers supervised. When supervising workers engaged in several occupations, is required to possess general knowledge of the activities involved. (US Department of Labor, 1991 p. 2)

In the study, reference is made to managerial work. This implies the work activities identified in the definition above.

*Engineer*

For the purpose of this study, the following definition was used for the term engineer.

A term applied to persons who possess *educational qualifications* [italics added], work experience, and legal certification where required as established by engineering schools, employers, and licensing authorities for employment in various fields of engineering. Engineers typically function in one or more activities, such as research, *development, design* [italics added], productions, consulting, administrations and management, teaching, technical writing, or technical sales and service. Classifications are made according to one or more engineering fields in which individual is qualified for employment, such as aeronautical, electrical, mechanical, chemical, mining, marine or nuclear engineering. (US Department of Labor, 1991, p. 5)
Transition

Transition is defined in *Merriam-Webster's Third New International Dictionary* as “a passage or movement from one state, condition, or place to another” (p. 2428). The term transition as used in this study refers to the change from being an engineer to being an engineering manager. This term was difficult to define in a succinct way. The change from engineer to manager includes the following two important aspects. First is the formal title change. The engineer was promoted to manager and given a new formal title in the organization. The formal title change represented the formal transition from engineer to manager. The second aspect related to actual job duties. The engineer and manager roles are defined above. An individual with the title of engineer could be performing a managerial function. Or an individual with a manager title could be doing engineering work. In defining the transition from engineer to manager, the change in actual job duties from engineer to manager duties was the informal side of the transition. The term transition, as used in this study, included both the formal transition as well as the informal transition time period. The transition began when the engineer was doing more than 50% managerial work and ended 2 years after the formal transition into the management role. Therefore, the word transition will refer to this transition period, which encompasses the informal and formal transition.

Summary of Definitions

The definitions of manager, engineer and transition have been presented. It is important to note the key distinction between the engineer and the manager: the manager is no longer doing the technical design work. The engineers, whom the manager
supervises, were doing the technical design work. This change in job function occurred over a period referred to as the transition.
CHAPTER 2

Review of the Literature

This chapter reviews the literature relevant to this research. The structure of the chapter is organized around three categories of literature. The first section focuses on the most relevant research-based sources—these are considered foundational. The second section contains related research literature. The third section includes pertinent non-research sources. Each of these are discussed below.

Section One: Foundational Research Studies

The following four publications are directly related to this study. Two examined the transition of engineers into management. One study was about the transition of sales professionals into sales management. The final study was about the experiences of executives. The latter one is considered here because the methodology provided important input to the study. The following is a summary of these research studies, each of which is discussed in more detail in the subsections following these brief summaries.

1. Blano (1996) conducted a dissertation that involved research into the transition from engineer to general manager. Blano’s research was similar to that performed for this study in examining the transition of engineers from individual contributor to manager. However, the focus of the study is different. Blano focused on the role of education in the transition, an issue that was not a focus of this study.
2. Hood (1990) presented research at a conference on engineering management. This article presents the research he carried out on the transition from engineer to manager. He discussed four key areas. One of the four areas was centered on the ‘issues’ that engineers dealt with in transitioning from individual contributor to manager.

3. White (1986) presented a description of methods used in studying key events in the lives of executives. The purpose and methods of White’s study were very close to those used in this research. The purpose was to understand the experiences of the executives. The methods involved interviews and qualitative analysis. The methodology described by White contributed to the design of this study.

4. Hill (1993) conducted a qualitative study of the transition experiences of sales managers in a financial services company and a computer company. The research was very pertinent to the current study. It explored the same transition experience as this study, only targeting the sales function in different industries.

Each study is examined in detail under the subsections that follow.

*Blano (1996)*

Blano (1996) examined the transition from technologist to manager, with emphasis on educational elements. The scope was broader than that for the current research but the topic was closely related. Blano’s research did not explicitly indicate that it was researching engineers since the term technologist was used. However, it was strongly weighted toward engineers since 12 of the 18 participants were from engineering. The remaining six were from scientific fields.
Description of the Research

Blano (1996) addressed the following question: “What role does education, in its various forms, plays in the successful transition of an individual from technologist to general manager” (p. 1).

List of Research Questions or Objectives

The objective of this study was to identify the role of education in the transition. Specifically, the research examined the relative contribution of four types of educational interventions: formal, non-formal, informal and experiential. In addition, the research discussed whether the participant was successful in the transition. The study compared the educational differences of successful and unsuccessful participants.

Description of the Methodology Used

Blano (1996) was a qualitative interview study. Technologists who either successfully or unsuccessfully attempted the transition to general manager were included. Each participant was interviewed one time. The interviews were tape recorded and then transcribed. The resulting data were analyzed using case analysis.

Description of the Approach to Sampling

Participants were selected because they had made the transition from technologist to general manager. To find candidates who met this criteria, the researcher worked with a professional organization, the Silicon Prairie Technology Association. In addition, he contacted individuals from his personal network of business associates. Participants from large, medium, and small companies were selected. These companies came from various
industries. Thirteen participants successfully made the transition and 5 participants were included who did not succeed in the transition, meaning they returned to a technologist role.

**Summary of Study Results**

The results of Blano’s (1996) study included the following. First, the educational interventions for those who successfully made the transition were different from those who did not. Those who successfully made the transition indicated that experiential learning was the most important aspect of their education. Formal education, such as an MBA, was ranked third out of the four education interventions and was important primarily as a ticket to entry and advancement. However, for those who did not succeed in the transition, education was ranked as the most important educational intervention. Second, it was discovered that cross-functional experience was a key educational content. Those who successfully made the transition all indicated that they had extensive cross-functional experience. Those who did not successfully transition did not have this same cross-functional experience. Finally, the cross-functional experience took place early in the career of the technologists.

**Key Limitations or Assumptions of the Research**

Blano (1996) identified himself as the interviewer and the instrument in the research as a limitation. Patton (2001) suggests that the researcher as the instrument is both a strength and a weakness of qualitative research. See chapter 3 for more information regarding the researcher as the instrument.
List of Issues for Future Research

Blano (1996) identified four issues for further investigation. These were: (1) replication of his study on a larger group, (2) examination of the role of education in sustaining management capability, (3) studying the role of mentoring in developing engineering managers, and (4) the analysis of the data gathered in his study from the perspective of other learning taxonomies.

Discussion of the Significance of the Study

Blano’s (1996) study was significant for three reasons. First, it identified the transition from technologist to manager as a unique area of study with specific issues and problems. Second, it examined educational elements and showed that experiential or on-the-job type learning was viewed as most important and valuable. Third, it provided insights into what experiences could help technologists succeed in the transition to manager. The second item listed above provides support for the current study. If on-the-job experiences were significant, then a better understanding of the experiences should provide valuable information.

Hood (1990)

Hood (1990) was the earliest, research-based source of information discovered that dealt directly with the transition from engineer to manager. The research was based on a literature review, informal interviews, and the results of a survey. The results were presented as a paper for the IEEE International Management Conference. The paper was prepared for the conference and appears to have targeted a practitioner audience. The full details of the methods were not directly laid out in the published account. The researcher
attempted to get more complete study details. However, no other source for the full
details could be located and attempts to contact the author via email and phone calls were
unsuccessful. The many unanswered questions regarding the methodology of the research
brought into question the value and validity of the study results. However, this study is
presented below due to the lack of research sources that more fully explain the
methodology of the study.

*Description of the Research Problem*

Hood’s (1990) study “explore[d] the trials and tribulations that engineers
experience as they transition from engineers to managers, specialist to generalist” (p. 22).
It targeted engineering managers who made the transition from engineer to manager in
high-technology engineering companies. The paper recounted the trials and tribulations
of engineers who transitioned into management. It also provided guidance for engineers
in the transition. This guidance included managerial and leadership skills and steps to
prepare for the transition.

*List of Research Questions or Objectives*

The paper does not explicitly state the questions or objectives underlying Hood’s
(1990) research. However, by looking at the results presented, at least four objectives
appear to have been explored: (1) the importance of selected manager characteristics, (2)
the importance of selected leadership traits, (3) ‘issues’ engineers deal with in the
transition to manager, and (4) important steps in the transition to manager.
Description of the Methodology Used

Hood (1990) stated the following regarding the research methods: “The methods used to determine the content of the this paper included personal experiences supported by library research of periodicals and literature and the results of a survey that was prepared and given to a targeted sample of engineering managers” (p. 22). He indicated that informal interviews were held but does not clarify what these interviews consisted of. The literature, personnel experience, and interviews provided the basis for selecting the items included in the survey, which the participants could select from. In identifying the ‘issues’, participants were asked to select the top ten ‘issues’ from a list of thirty. The importance of the manager characteristics and Leadership traits were gathered by having the managers rank the importance of individual items using a 1 to 10 scale.

Description of the Approach to Sampling

The sampling approach identified a “targeted sample” (Hood, 1990, p. 22) for inclusion in the survey. The sample included “a cross-section of engineering managers at many high-technology engineering companies such as Northrop, McDonnell Douglas, Rockwell, Hughes, JPL, Lockheed” (p. 22). This cross-section included managers from the first level manager to the Vice President.

Summary of Study Results

Hood (1990) reported the survey results corresponding to the five items mentioned above as research objectives. How many surveys were distributed, and the response rate, were not provided. The results of the survey are presented as follows. First,
the five managerial characteristics identified by engineering managers as most important.

They were:

1. Communicate skillfully (8.8/10),
2. Appropriately staff (8.6/10),
3. Direct efforts (8.4/10),
4. Support and guide (8.4/10), and
5. Handle problems (8.0/10).

Second, the four most important leadership characteristics were identified as:

1. Bringing out the best in people (8.9/10),
2. Positive example (8.4/10),
3. Dynamic approach (7.5/10), and
4. Day to day operations (6.7/10).

Third, the ten issues selected most frequently by engineering managers were:

1. Delegating appropriately,
2. Ability to communicate skillfully,
3. Directing and guiding others,
4. Organizing a project,
5. Using collaborative and participative management practices,
6. Identifying the key information to make a decision,
7. Dealing effectively with unknowns and uncertainty,
8. Balancing quality and perfection with time and resource constraints,
9. Determining what style of management fits a situation, and
Fourth, the five most frequently selected steps considered important in the transition to engineering manager were:

1. Being given assignments that will develop management skills,
2. Being a lead person,
3. Being given assignments that will clarify management roles and responsibilities,
4. Acquiring formal management training, and
5. Accumulating significant years of technical experience (5.9 years was the mean, with 5 years being indicated by 45% of participants).

These findings were significant because they identified how the managers ranked the issues in the survey regarding the transition from engineer to manager. The findings also provided other transition-related items the managers selected as important.

*Key Limitations or Assumptions of the Research*

A key limitation of this research was that the full details of the research methodology were not included in the article. In addition, there were other limitations for the current study. First, the study sample included the full range of managers, from first level up to the vice president. No information was provided about how different levels of management responded. Second, on the survey provided, participants were given a list to select from. The source of that list was not clear and the results can only be as valid as the list they select from.
List of Issues for Future Research

Two suggestions for future research were given. First, update the survey periodically and compare the results to evaluate changes in the work environment over time. Second, correlate the responses with participant background, experience and products they work with.

Discussion of the Significance of the Study

Hood’s (1990) study was significant for two primary reasons. First, it has nearly the same primary research objective. According to the opening paragraph, “explore[d] the trials and tribulations that engineers experience as they transition from engineers to managers” (Hood, 1990, p. 22). The results provided background and comparison potential for the current study. Second, the list of ‘issues’ identified could be compared to the results of the current study for insights and possible future research into discrepancies. This comparison is provided in chapter 5.

Hill (1993)

During interviews with middle managers regarding training, Hill (1993) was surprised by the significance the managers gave to their first experiences as a new manager. After discovering that “few systematic or rigorous studies had been done on the transition to management” (p. 305), she chose to conduct a study of the first-year experiences of new managers. The managers went from a primary contributor role to the manager role. The participants were sales managers from two companies: a financial services company and a computer company.
Description of the Research Problem

Hill (1993) investigated the personal experience of becoming a manager. The following questions were the initial thrust of the research:

(1) What are the key demands and challenges of the transition? (2) What resources do individuals most often rely upon to manage the key demands and challenges of the transition? and (3) What factors (individual, job, and organizational) are associated with successful transitions? What factors are associated with unsuccessful transitions? (pp. 310–311)

Understanding the experiences of those who go through the process was important to enabling management development efforts to address the needs of the new managers.

During interviews with middle managers regarding training, Hill (1993) was surprised by “the apparent potency of managers’ first experiences on the job” (p. 305). She discovered that “few systematic or rigorous studies had been done on the transition to management” (p. 305). Most of the studies that had been done “treated the transition as an event rather than a process and usually ignored the more person-centered aspects of the transition” (p. 306). In addition she noted that very little knowledge existed regarding “how managers learned to do their jobs” (p. 305).

List of Research Questions or Objectives

The research identified three objectives. Hill (1993) stated the first “objective was to describe the experience of becoming a manager from the new manager’s point of view: What do new managers find most challenging? How do they learn to be managers? On
what resources, individuals and organizational, do they rely” (p. 306)? This understanding provided the basis for the other objectives. The second objective was the desire “to provide a conceptual framework for making sense of the transition to management and to generate fruitful hypotheses for further investigation” (p. 306). The third objective was to provide input to management development efforts by providing “an understanding of how new managers think and feel about the experience of becoming a manager” (p. 306).

Description of the Methodology Used

Hill (1993) conducted a qualitative field study. She spoke with and observed 19 new managers during their first year on the job. The data collection was based primarily on semi-structured interviews and observations that took place at intervals over the course of the managers’ first year. Hill estimates that an average of twelve days were invested for each participant. This included interviews with the participant, supervisors, subordinates and others in the organization, as well as observations. The design was set up to gather longitudinal data over the course of the year. However, it was noted that no longitudinal phases or stages emerged.

The data were analyzed by iterative content analysis to inductively find the themes and make sense of the data. The details of the analysis process were not described.

Description of the Approach to Sampling

Hill (1993) identified two companies—one in securities and the other in the computer industry. These companies were selected for three reasons: (1) they were in
industries experiencing a lot of change, (2) they were leaders in their industries, and (3) they had a reputation for significant management development training. Ten managers in one and nine in the other were selected because they were newly promoted to the first level of management in their respective sales organizations. The sales organization was selected because there was limited research on the transition to sales management.

Summary of Study Results

The key overall finding was contained in the statement: “The transition to manager is not limited to acquiring competencies and building relationships. Rather, it constitutes a profound transformation, as individuals learn to think, feel, and value as managers” (Hill, 1993, p. 5). A few findings related directly to the current research may be found below.

1. “Building effective relationships with their subordinates was unequivocally the most difficult task the new managers faced” (Hill, 1993, p. 93).

2. The new managers’ expectations about being a manager were inaccurate. These inaccurate expectations contributed to the challenge of becoming a manager since the daily realities of the manager role caught them by surprise. Some of the surprises included: (1) the heavy workload; (2) rather than being organized and calm, things were hectic: more like firefighting; and (3) the realization that they had to get things done through others and thus were dependant on their subordinates. To produce the results they were accountable for, they had to develop and assist their subordinates as well as remove obstacles for their subordinates without taking over. Then, (4) as they assumed formal authority, they were often viewed as the enemy by their subordinates/former peers.
3. The new managers were promoted for technical competence but were now in a role where managing people was the primary skill. The following specific skills were mentioned: (1) the importance of understanding and motivating people, (2) the need for communication skills, and (3) the challenge of dealing with subordinates who covered a wide performance range from marginal to outstanding.

4. “Learning to delegate was perhaps the most difficult challenge the managers faced in managing subordinates’ performance.” (Hill, 1993, p. 147)

5. The decision to move into management caused the participants some anxiety. They pondered the change and the significance it held in their careers.

6. The new managers had to deal with a lot of stress and emotions.

**Key Limitations or Assumptions of the Research**

The author identified the limitation of relying on self-report as the source of input for personal change. However, she also noted that it was unclear how else one could get this sort of information. Another limitation referred to by the author was that the results were not generalizable. The participants were sales managers from two companies: one in securities and one in computers. It was therefore limited both in the industry and in company function.

In addition, the study made the assumption typical to a qualitative interview study: that the experiences of others could be appreciated, understood and studied through interviews and observations.
List of Issues for Future Research

Hill (1993) suggested further research on managers in various functions in the discussion of the generalizability of the study.

Discussion of the Significance of the Study

This study identified key issues in the transition from contributor to manager in the sales function. The objectives of the study, while larger in scope, aligned closely with the current research. The results of Hill’s study and those of the current research could be used to strengthen and support each other. The current study actually did as suggested by Hill (1993) by studying the transition of managers in another business function. In addition, comparisons could be made to identify potential differences in the transition for managers in engineering versus sales. A brief comparison of the Hill’s (1993) findings will be provided in chapter 5.

Another value was as a comparison point for the data analysis phase of the research. The categories or themes identified by Hill were compared with those extracted from the interviews in this study, providing strength and support for the validity of the research findings.

White (1986)

White (1986) provided a description of methods for a study of executive experiences. This was done so that others could use it as a guide. The research was initiated in 1982 by Morgan McCall, Ann Morison and Michael Lombardo at the Center for Creative Leadership. It involved interviews with 79 executives from 3 Fortune 100 companies. This research, plus a follow-up survey, provided the basis for the book, The
Lessons of Experience: How Successful Executives Develop on the Job (The Free Press, 1989). The topic of the research was somewhat related to engineering management. However, the overall goal of the research, and especially the methodology were important and relevant to the current research. A description of the methods used in this study is presented below.

Description of the Research Problem

The underlying goal of the research was to examine the issue of “how organizations can influence the development of managers” (White, 1986, p. 5). Existing research established that experience made a difference and was the most important element identified by managers in their development. What was lacking was an understanding of which experiences made a difference and how they mattered or what lessons they taught.

List of Research Questions or Objectives

The study described by White (1986) sought to identify the three key developmental events in the careers of the managers who participated. For each of these key events, White wanted to know what had happened and what the manager learned as a result of that experience. Gathering the results for these two questions provided the basis for implications made regarding the development of managerial talent through experiences.
Description of the Methodology Used

The study described by White (1986) was based on qualitative interviews. Interviews were conducted with 86 executives/managers at three Fortune 100 companies. Seven of the original 86 were dropped during the analysis phase since it was decided that they were not high enough in the corporate organization. The interview questions incorporated the following techniques. The open-ended questions used the critical incident methodology (Flanagan, 1954). The interview guide sequenced the questions in order of priority so that they were sure to gather the critical data. The questions were provided to participants in advance of the interview. Participants were interviewed for two hours or more. A pilot study was conducted to test-out questions and ensure the researchers comprehended the terminology used by the managers.

The data analysis began with event categorization. First, the researchers identified events that were “conceptually distinct” (White, 1986, p. 15). The key features of each event were identified and abstracted. Next, the events were grouped into categories. Then all of the events were assigned to one of the sixteen categories. This analysis was carried out primarily by a team of five social scientists, including the three primary researchers. The three primary researchers also conducted the interviews.

Description of the Approach to Sampling

The study used criterion sampling. The participants were high-level managers in the top 10-20 jobs in the company or actively in the running for these jobs. The focus was on successful managers. Working with the sponsoring organizations, they identified a subgroup of high-ranking managers. Within this group they asked for referrals for others.
The final list was checked to ensure it covered both the present and future leadership of the respective organizations.

Summary of Study Results

From the 79 interviews White (1986) identified 286 events, which were grouped into 16 event categories. They also identified 529 lessons, which were grouped into 31 lesson categories. The two sets of categories were also related to show what lesson categories were associated with which event categories and which events taught a specific lesson. The results were identified in terms of how many participants identified each lesson and event and other simple statistical analysis of the resulting data. Since the actual findings are not directly related to the current study, details of the findings are not presented here.

Key Limitations or Assumptions of the Research

White (1986) identified two limitations. One was that participant recollections might be somewhat self-serving, particularly since the participants’ organization was formally involved in the study. The second was the possibility of groupthink during analysis resulting in “strange interpretations” (p. 39).

In addition to the limitations identified by the authors, here are three limitations from the perspective of the current research. First, the study presented by White (1986) focused on large companies. All participants were from Fortune 100 companies. The results are transferable primarily to that group of companies. Second, the backgrounds of the participants were not discussed. The present research was looking at engineering, probably a small subset of the group targeted by White (1986). No distinction was made
in where the managers came from. Those who came from engineering versus sales backgrounds may have experienced different events and lessons. This information may have provided valuable information regarding transition difficulties. Third, the industry of the companies was not provided. Technology companies with large engineering groups in their workforce may have different issues than a commodity manufacturing firm.

List of Issues for Future Research

White (1986) did not identify future research possibilities.

Discussion of the Significance of the Study

The study described by White (1986) was an interesting and extensive research project. The results might have been more directly related to the current research if there had been more background about participants and if some of the companies involved had been engineering intensive. That information was not available. However, the methodology used for this study provided methodological support for the current study. The methodological choices made have been incorporated in this research when appropriate, such as the inclusion of participants from three companies, suggestions on what questions were most effective, the use of interviews to understand the experiences of managers, and the use of an interview guide.

Section Summary

This section reviewed four research studies. These studies demonstrated research findings directly related to the current study or provided methodological guidance from similar studies. The next section reviews some additional related research.
Section Two: Related Research

In addition to the articles discussed above, three articles related to this research. These research-based articles provided support for promoting engineers to management and how to select and prepare engineers. A brief word about these follows.

Roberts and Biddle (1994)

In light of the challenges faced by engineers and scientists (they use the term technologist) in making the transition to manager, Roberts and Biddle (1994) researched the decision to promote scientists and engineers into management. They found that it was effective to promote technologists. A good technical worker had a high correlation to being a good manager. This was in part because good technical skills, and an understanding of the work being done, are important in managing technologists. However, the fact that promoting technologists to managers is successful does not say anything about the difficulties faced by the person asked to make this change. This research supported the current study by demonstrating that promoting a technologist to a managerial role was effective.

Thamhain (1991)

Thamhain (1991) examined the characteristics required to be an effective engineering manager. Specifically, this study looked at what companies should look for when considering the promotion of an engineer to manager. A survey was administered to 210 managers and 640 of their subordinates in 55 technology-oriented companies. The results identified five personal characteristics important for a successful transition from engineer to manager. From these results an aptitude test for identifying the characteristics
was created. The five characteristics were: (1) a personal desire to be a manager, (2) people skills, (3) technical knowledge, (4) administrative skills, and (5) business acumen. This research was valuable because these characteristics identified potential skills an engineer would need to develop in the transition to management. The development of these skills could be a challenge.

*Thamhain (1992)*

Thamhain (1992) contributed to the body of knowledge surrounding the topic of the current study through this article, which dealt with two aspects of engineering management. These two aspects were (1) the skills required to be an effective engineering manager, and (2) how effective engineering managers believed training and development methods were in developing these skills. The information presented was based on a survey of 220 engineering managers combined with data collected from interviews and training records. The results included a skills inventory for engineering managers. The skills inventory was grouped into the three categories: (1) leadership skills, (2) technical skills, and (3) administrative skills. Experiential or on-the-job training was considered the most widely used and most effective development method. If experiential development was the most common and most effective, the current study’s importance is further supported. An understanding of what the engineer experienced and found difficult was important to understand. This understanding may lead to improved techniques for supporting engineers who are making the transition.
Section Summary

This section discussed three articles that described research related to the overall objective of this study. These articles supported the practice of promoting engineers to manager and suggested how to best prepare the engineers for the manager role. However, the articles did not deal with the specific experience or what was difficult about the transition.

Section Three: Non-Research Literature

The two literature sources presented below are informative but do not identify any research as support. What they do provide is information directly related to the topic of this study. One source provided a list of difficult elements of the transition; the other presented a comparison of the skills of the engineer and the skills of the manager. Each is briefly discussed.

Badawy (1995)

Badawy (1995) provided a list of difficulties in the transition from engineer to manager. The list was described as 18 “major problems encountered by first line RD&E supervisors and managers” (p. 26). However, no information was provided about where this list came from.

The Difficulty of the Transition

1. Insufficient definition of policy from top downward

2. Defining the goal of a problem, interpreting to the researcher its importance to the company, and selecting potential rewards for a solution in order to motivate
3. Budgeting manpower and assignments; determining priorities

4. Encouraging creativity

5. Doing things myself that I could delegate

6. Putting out brush fires

7. Determining optimum degree of help to give to individuals

8. Dealing with excessive secondary demands on my time; paperwork; inconclusive meetings

9. Dealing with manpower shortages

10. Maintaining my own knowledge in fields supervised

11. Gaining time to test a product properly before it is sold

12. Obtaining marketing analyst's intelligence data--too little and/or too late

13. Providing recognition for and reward individual accomplishment

14. Dealing with poorly written reports from group members

15. Getting details cleaned up after a solution

16. Overcoming restrictive salary policy, handicapping employment of able personnel

17. Evaluating applicants

18. Interpreting results of RD&E personnel (p. 27)

This list provided a comparison tool for the results of this study. A comparison of the overlapping items with the results of this study is presented in chapter 5.
Medcof (1985) provided a set of categories that identified specific differences between skills and attributes of engineers versus managers. The change from primarily producing, to working through others, was at the center of the differences. The categorization highlights the difference between the two roles and provides some insight into why the change in roles was so difficult. This article was important because the current study tested the assertion by Medcof (1985) that the change from producer to managing producers was important to understanding the transition. The results in chapters 4 and 5 provide some support for Medcof’s (1985) assertion.

Section Summary

This section presented two non-research-based sources of information relevant to the research conducted for this study. Badawy (1995) presented a list of 18 difficulties in the transition, and Medcof (1985) discussed the differences between the engineer job and the manager job.

Chapter Summary

In this chapter the literature related to the transition from engineer to manager was discussed. The literature review revealed a lack of published research on what engineers experience and find challenging as they transition to manager. The literature review was separated into three sections. In the first section, four foundational studies were presented. Two of these studies dealt with the transition of engineers. One examined the transition of sales managers. The final study dealt with executive career experiences. In the second section, three related studies were briefly discussed. These studies provided
support for promoting engineers into management and suggested selection and
development practices. In the third and final section, directly relevant material was
presented from two non-research-based articles.
CHAPTER 3

Methods and Procedures

This chapter discusses the methodology used in the study. It is important to “explain the process by which you collected and interpreted your data” (Bogdan & Taylor, 1975, p. 142). The validity of the research corresponds to the quality and rigors of the methodology and process used. The chapter begins with an overview of the research process. Figure 1 identifies the twelve-step research process used in this study. The five sections following the overview are linked to the steps in Figure 1. The first section is a discussion of qualitative research and the rationale for selecting the methodologies used. The second section details the data collection procedures and techniques. The third section covers the data analysis process and techniques. The fourth section is a discussion of the quality and credibility of the study. The fifth and final section is a short discussion of methodological limitations of the study.

Overview of the Research Process

Figure 1 shows the twelve-step process used to conduct the research in this study. The first phase involved identification of the research topic and the literature review. These were presented in chapters 1 and 2. This chapter focuses on the study design in phase two, and the execution of that design in phase three.
Phase One: Identify the research topic: Researcher interest and a literature review

Phase Two: Select an appropriate theoretical perspective and design the study

Qualitative Research

Methodology and Technique Selection
Step One: Understanding the purpose of the study
Step Two: Quantitative or Qualitative: Rationale for a qualitative approach
Step Three: What qualitative methods: Rationale for an interview-based study
Step Four: Which theoretical and philosophical perspective and which methods

Data Collection
Step Five: Create data collection design
- What is the unit of analysis
- Sampling: Selection of participants
- Interview design and supporting instruments

Data Analysis
Step Six: Create data analysis plan
- Case analysis
- Cross case analysis
- Theme identification and refinement

Test the Study Design
Step Seven: Human Subjects Review and Approval
Step Eight: Conduct pilot study

Phase Three: Conduct the Study
Step Nine: Human Subjects Review and Approval
Step Ten: Collect the data
Step Eleven: Analyze the data
Step Twelve: Verify the quality and credibility of the study
- Triangulation
- External methodology review

Figure 1. Twelve-Step Research Process Map
Qualitative Research

This section covers the decision to use a qualitative research methodology. The section corresponds to steps one through four: (1) a consideration of the study’s purpose; (2) a discussion of the selection of a qualitative research methodology; (3) the rationale for using interviews as the method of data collection; and (4) a discussion regarding the decision to base the research in the tradition of phenomenology.

The Purpose of the Study

It is important to be clear on the purpose of a research project since “decisions about design, measurement, analysis, and reporting all flow from purpose” (Patton, 2002, p. 213). The purpose of this research was to better understand a societal issue. The issue examined was the transition from engineer to manager, as explained more fully in chapter 1. The reason for understanding this issue was to provide the basis for improving the transition for engineers. The purpose identified this research project as primarily applied research. Understanding the purpose of the research helped to guide design decisions.

Rationale for Conducting Qualitative Research

Qualitative methods were the appropriate way to answer the research questions. The selection of the appropriate research methodology was important. The first indication leading toward a qualitative methodology was the lack of sufficient research into the transition from engineer to engineering manager. The literature review in chapter 2 demonstrated that the research into the transition from engineer to engineering manager was still in an exploratory phase of investigation. The first step toward gaining insights
into how this issue could be resolved involved gaining an in-depth understanding of the transition experience for engineers who become managers. As Patton (2002) states, “qualitative methods permit inquiry into selected issues in great depth with careful attention to detail, context, and nuance” (p. 227). Gaining this detailed information was best facilitated by qualitative methods. A discussion of qualitative methods, and support for the use of these methods, are discussed next.

**Nature of Qualitative Research**

This section discusses the nature of qualitative research. First, an overview of qualitative research is presented. Then qualitative methods are compared to quantitative methods. Finally, appropriate uses of qualitative methods are discussed.

*What is qualitative research?*

Qualitative research refers to a variety of research approaches that have a few underlying commonalities. In contrast to the quantitative approach to research, which emphasizes an approach similar to the natural or physical sciences (Ary, Jacobs, & Razavieh, 1996), qualitative research relies on methods that allow for a holistic understanding of social phenomena. The often-complex nature of social phenomena is appropriate for such qualitative methods. The following items are a few distinguishing features of qualitative research methods.

*Qualitative Compared to Quantitative*

Table 1 presents a comparison of qualitative and quantitative research. This table is not intended to be exhaustive, but rather to indicate general points.
Table 1

Comparison of Qualitative and Quantitative Research

<table>
<thead>
<tr>
<th>Qualitative</th>
<th>Quantitative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holistic</td>
<td>Discrete</td>
</tr>
<tr>
<td>Context is important</td>
<td>Instrumentation</td>
</tr>
<tr>
<td>The researcher is the instrument</td>
<td></td>
</tr>
<tr>
<td>Emerging Theory</td>
<td>Hypothesis testing</td>
</tr>
<tr>
<td>Purposeful sampling</td>
<td>Random Sampling</td>
</tr>
<tr>
<td>Inductive</td>
<td>Deductive</td>
</tr>
<tr>
<td>Transferability</td>
<td>Generalization</td>
</tr>
<tr>
<td>Seeks understanding</td>
<td>Seeks to make predictions</td>
</tr>
</tbody>
</table>

*Note. Adapted from Blano, 1996, p. 27.*

*What are appropriate uses of qualitative methods?*

The use of qualitative methods was appropriate for this research. Patton (1990) states that qualitative methods “are ways of finding out what people do, know, think and feel” (p. 94). The nature of the transition from engineer to engineering manager, common experiences for those who make the transition, and what individuals find challenging or difficult about the transition, are questions appropriate for the use of qualitative methods. Answering these questions required gaining the perspective of the individuals, understanding their experiences and learning their feelings regarding these experiences.

*Rationale for an Interview-based Study*

This study used interviewing as a means to gather and record the experiences of the participants. “The purpose of interviewing is to find out what is in and on someone
else's mind…. We interview people to find out from them the things we cannot directly observe” (Patton, 1990, p. 278). Asking managers who had made the transition was the best way to discover the nature of the transition, and what things are challenging about it. Analysis of multiple individual experiences, as understood and recorded during interviews, provided the raw data used to uncover answers to the research questions. More detail regarding the interview design is provided in the data collection section below.

Rationale for Basing the Study in the Tradition of Phenomenology

This section discusses phenomenology and why it was selected as an appropriate qualitative methodology upon which to base this study.

Phenomenology

This study was based on the perspective of phenomenology, a qualitative tradition developed and first used by Edmund H. Husserl (1859-1938), a German philosopher. It relies on “the assumption that there is an essence or essences to shared experience. These essences are the core meaning mutually understood through a phenomenon commonly experienced” (Patton, 1990, p. 70). Through an examination of the experiences of individuals, research can uncover shared experiences. The approach “focuses on the question: ‘What is the structure and essence of experience of this phenomenon for these people?’” (Patton, 1990, p. 69). This study utilized the qualitative perspective of phenomenology to seek an understanding of the transition of engineers into management. The concept of a shared experience was the key reason why phenomenology was selected instead of other qualitative approaches. An alternative qualitative method considered was
grounded theory. This qualitative tradition focuses on the question “What theory emerges from systematic comparative analysis and is grounded in fieldwork so as to explain what has been and is observed?” (Patton, 2002, p. 133). This tradition, and the processes it utilizes, would have been useful for this study. However, the emphasis of phenomenology on the shared experience, as perceived by the managers in the study, made it a more appropriate perspective. Patton (2002) discussed what sorts of questions phenomenology is appropriate for as follows:

Exploring how human beings make sense of experience … how they perceive it, describe it, feel about it, judge it, remember it, make sense of it, and talk about it with others. To gather such data, one must undertake in-depth interviews with people who have directly experienced the phenomenon. (p. 104)

This study was based on qualitative interviews based on the perspective of phenomenology. The distinction between basing a study on phenomenology, and doing a phenomenological study is an important one. This study made the assumption that the transition from engineer to manager was difficult. This assumption was based on the literature review and on personal experience. It could be suggested that the essence of the transition is its difficulty. This study examines what was difficult about the transition. What did the managers find difficult? What common or shared experiences were there that contributed to the difficulties? The research did not examine everything about the transition; rather, it focused on what was difficult. For this reason, it was an interview study based on a phenomenological perspective.
The choice of phenomenology provided guidance for the procedural aspects of the study design. Creswell (1998) identified the following process for a phenomenology study.

1. The researcher needs to understand the philosophical perspectives behind the approach, especially the concept of studying how people experience a phenomenon. The concept of epoche is central, where the researcher brackets his or her own preconceived ideas about the phenomenon to understand it through the voices of informants.

2. The investigator writes research questions that explore the meaning of that experience for individuals and asks individuals to describe their everyday lived experiences.

3. The investigator then collects data from individuals who have experienced the phenomenon under investigation. Typically, this information is collected through long interviews … with the informants ranging in number from 5 to 25.

4. The phenomenological data analysis steps are generally similar for all psychological phenomenologists who discuss the methods … the original protocols are divided into statements … then the units (statements) are transformed into clusters of meaning … [and then] are tied together to make a general description of the experience.

5. The phenomenological reports ends with the reader understanding better the essential, invariant structure (or essence) of the experience,
recognizing that a single unifying meaning of experience exists. (pp. 54–55)

This process directed the study design. As identified in Figure 1, it represents how the general guidelines were applied to this study. Cresswell’s (1998) steps correspond to Figure 1 as follows:

1. Step four addressed understanding the philosophical basis of phenomenology.
2. Step five was the point in the process when the interview guide was designed to ask the managers regarding their experiences.
3. Step ten occurred when the managers who had made the transition were interviewed.
4. Step eleven included the analysis of the statements by the participants. This analysis used the manager statements to create experiences. The experiences were grouped into themes.
5. Chapter five is where the results were presented.

These steps are discussed in more detail in the following section.

Data Collection Procedures and Techniques

This section discusses the details of the procedures and techniques used in this study. It covers the combination of steps five and ten as shown in Figure 1. This combination allows the study design, and how it was executed, to be discussed together. In the research process shown in Figure 1, the pilot study was conducted between the design and execution of the study, as a test of the design. A discussion of the pilot study is the first topic below. The second topic involves how emergent design was used in the
data collection. The third topic is an identification of the individual as the unit of analysis. The fourth topic is sampling, or how the participants were selected. The final topic discusses the data collection instruments, the interviews and the researcher.

Pilot Study

Step eight in the research process map (see Figure 1) was to conduct a pilot study. The use of a pilot study was recommended by Maxwell (1996) as a way to understand the concepts of the participants and to test the research methods. White (1986) provided additional insight into its value. Here was how White (1986) described the purpose of the pilot study: “Trying out the questions, discovering which probes worked, and having them [(pilot participants)] critique the method and content” (p. 8). A pilot study was conducted for this research to test the study design. Prior to the pilot study, the researcher’s dissertation committee reviewed the study design. In addition, approval from the Office of Research Protection at Penn State was obtained. This was step seven in the process map shown in Figure 1. The pilot study interviews occurred during the summer of 1999. The participant was a new engineering manager in a computer technology company. The participant fit the sampling criteria except that he was not located on Long Island, New York and he was not in the aerospace industry. The pilot study provided an opportunity to do as recommended by Maxwell (1996): it (1) ensured understanding of the concepts presented by the manager, (2) tested the data collection tools including the questions, and (3) conducted a partial test of the analysis approach. It is valuable to discuss the data collection tools further. The interview guide structure and questions were tested during the pilot study. As a result, improvements were made to the interview
guide. Questions were adjusted or dropped as a result of participant comments and feedback. The case review portion of the analysis was completed for the participant. This resulted in further refinement of the interview guide and demographic information requested. An additional benefit of the pilot was the opportunity to test the recording equipment and reinforced the importance of taking notes during the interview. Portions of one interview in the pilot study were lost due to equipment problems. The overall result was that it provided valuable input into the final design of the research and prepared the researcher for the full study. The discussion that follows identifies the details of the study design.

Emergent Design

The design of the study was established prior to interviewing. However, “a qualitative design needs to remain sufficiently open and flexible to permit exploration of whatever the phenomenon under study offers for inquiry. Qualitative designs continue to be emergent even after data collection begins” (Patton, 1990, p. 196). Guidelines, which were established prior to the initiation of data collection, directed the course of the study: but the element of flexibility within those guidelines was important. The interview guide and the sampling criteria assisted the researcher in staying focused during the research process. Adjustments to the original design plan occurred as the data collection and analysis proceeded. These adjustments are discussed in the appropriate sections below.

Unit of Analysis

For this study the unit of analysis was the individual. In qualitative research the unit of analysis is an important part of the design.
Decisions about samples, both sample size and sampling strategies, depend on prior decisions about appropriate unit of analysis to study. Sometimes individual people … are the unit of analysis. This means that the primary focus of data collection will be on what is happening to individuals in a setting and how individuals are affected by the setting. (Patton, 1990, pp. 166–167)

The individual as the unit of analysis allowed the conclusions of the research to be about the individual experience.

**Sampling**

Sampling refers to how potential participants were identified for participation in the study. In qualitative research purposeful sampling is commonly used. The following is a discussion of purposeful sampling and how it was used in this study.

**Purposeful Sampling**

Participants were selected because they had characteristics that were desirable for the purpose of the study. This is referred to as purposeful sampling. “The logic and power of purposeful sampling lies in selecting information rich cases for study in depth” (Patton, 1990, p. 169). The types of purposeful sampling used in this study were typical case and criterion. Typical case sampling means that cases are selected because they are common or typical. Criterion sampling indicates that selected attributes or qualifiers are used in selecting who will be part of the study. Criterion and typical case sampling worked together by creating criterion that identify typical cases. Marshall and Rossman (1999) indicated that criterion sampling helps strengthen the quality of a study. The group of interest in this research was engineers who transition to engineering management
without having formal business training, such as an MBA, prior to making the transition. A copy of the Participant Selection Guide may be found in Appendix A. Five key criteria were used to identify the group of interest for this study:

1. Must have an engineering or related technical degree
2. Must have started as an engineer (at least 5 years as engineer) and then transitioned from engineer into an engineering manager role
3. Must not have pursued business degrees prior to the transition into management
4. Must have transitioned to manager in the last 1–5 years

The first and second criteria are related to being a typical case. Engineering managers in the aerospace companies on Long Island identified the technical degree as the typical background (almost a requirement) for becoming an engineer. The typical situation was for an engineer with a technical degree to be promoted out of the engineer role into an engineering manager role (Roberts & Biddle, 1994). The technical degree was a requirement based on the engineer definition provided in chapter 1. The 5 years as an engineer requirement was based on the literature findings (Hood, 1990; Lavoie & Finnie, 1998; Roberts & Biddle, 1994). According to these sources the transition from engineer to manager began occurring after two to four years as an engineer. However, most do not occur until after five or more years have been spent as an engineer.

The third criterion was to identify engineers who began the transition into management without initiating work on a management degree. If the manager began such a program after the transition, that was acceptable. There were a few reasons for this research design choice. The focus of this research was on the engineer who moved from
being an engineer to a manager without initiating formal management education. The work by Blano (1996) involved interviews with 18 engineers/scientists who were currently in management or had at one point had been in management. Only 5 of the 18 had MBAs. No indication was given whether the MBA was received before, during or after the transition. The majority did not have formal management training prior to the transition. This finding concurred with the experience most common in the companies included in the study: an engineer with no formal business training was promoted to manager. After the move into management some then pursued a management degree. One exception should be noted here. During the initial work to understand the typical case, the researcher did encounter one company in which a manager indicated that the organization tended to move people into engineering management who already had the management degree. Due to sampling criteria a manager from this company was not included in the study.

The fourth criterion was intended to ensure that the manager had been in the manager role long enough to comment, from personal experience, about the transition. The first part of this, the one year in the manager role, was selected as long enough to experience a wide range of experiences in the manager role. Hill (1993) studied managers during the first year following their promotion. She indicated that, over the course of the year, a manager encountered a wide range of challenges and experiences. She suggested that generally managers began to feel in charge of their roles after about three years in it. With this basis, and for practical reasons, the one-year minimum and five years as the maximum were selected. This criterion was one impacted by the emergent design of qualitative research. During the research, after four participants had been interviewed, the
data analysis demonstrated significant redundancy. It was also noted that a long period in the transition was common. The transition was the period when the participant was acting in a manager role without the formal title. The time frame ranged from one year to almost seven years. The average was over four years. To test the study results up to that point, the decision was made to select a fifth participant who was currently in the transition, but had not received the formal title of manager. This participant had been acting in the manager role for about a year, but still carried the formal title of engineer. This adjustment to the criteria provided a test of the validity of the data, prior to making the decision to stop including additional samples. The data from this participant were compared to those from the others to see if those in the middle of the transition perceived the experience differently from those who were recalling their transition a few years afterwards. The results are discussed in the data analysis section. How this decision affected sample size is discussed further in the sampling discussion below.

The second aspect of the one- to five-year range was the upper limit of five years. The five-year limit was selected so that the managers’ recollection of the transition would be less than five years old. Doing so allowed a window of a few years so that there would be enough potential managers to participate in the study. The use of five years since the transition, as a requirement for participation, resulted in a fairly small participant pool. Numerous managers who were potential participants were excluded by this criterion. However, this aspect of the criteria was not adjusted since more recent memories were deemed more valuable than a larger participant pool and were believed to have resulted in better data to analyze.
The fifth and final criteria limited the scope of the study. The selection of a limited geographic area and a specific industry within that geography limited the scope and impacted the sample size as discussed below. Aerospace companies on Long Island, New York at the time of the study included: BAE Systems, Lockheed Martin, Northrop Grumman, Parker Hannifan, and Telephonics.

In addition to the above discussion of the sampling of specific individuals, cases were selected that represented at least three separate companies. This was intended to avoid biases introduced by unique elements of a single company. It was also an attempt to ensure the research covered “typical” transitions. The decision to use three companies was borrowed from the methodology of White (1986) discussed in chapter 2.

How Managers were Invited to Participate

Using the guidelines discussed above, individuals (engineers and managers) in aerospace companies on Long Island were contacted and asked to refer new managers for potential participation in the study. The researcher had access to a large number of engineers and managers through personal contacts. These individuals referred new managers. These managers were then contacted via phone, email or in person to determine if they were interested in participating. The purpose and methods of the study were described to the potential participants, if they were interested; the participant selection guide (discussed in detail above) was used to determine if they fit the criteria for participation. In addition, potential participants were provided with the informed consent form. The Penn State Office for Research Protections approved the informed consent form. A copy of the consent form is included in Appendix A. Those included in
the study met the sampling criteria, were willing to participate, and signed the informed consent form.

Sample Size

Sample size refers to the number of participants in the study. Creswell (1998) identifies 5–25 participants as the typical range for a study based on phenomenology. Patton suggests that “there are no rules for sample size in qualitative inquiry. Sample size depends on what you want to know, the purpose of the inquiry, what’s at stake, what will be useful, what will have credibility, and what can be done with available time and resources” (p. 184). In the research proposal, a range of six to ten participants was suggested. The objective of this range was to follow the methodology presented by White (1986) and have representation from three companies. Two managers from each of the three companies would be six participants. Due to limited resources, the upper limit of ten was selected. For the reasons explained below, the study had five participants. There were a number of reasons for the selection of five participants. First, the scope of the study was narrowed after the initial proposal—limited by geography, industry and number of years since the transition. This created a small and well-defined target population. The result of the narrow focus was that after three interviews it was clear that the experiences were very similar. The fourth interview resulted in some small adjustments but nothing new in the primary areas surfaced during the first three interviews. The following quote from the fourth manager clearly highlighted the redundancy: “The peer-subordinate [relationship] was probably the most challenging I think.” This became Theme 2. “And the second was working and managing,” This
became Theme 1. “And that goes hand in hand with delegation” (Ron 3/6/8). This became Theme 3. This manager identified in order of priority the three most common items that had already surfaced during the prior interviews. At this point, the decision was made to modify the sampling criteria to include an engineer who was actually in the transition. This decision was discussed above. The data from the fifth participant further reinforced existing data but did not introduce any significant new information. Lincoln and Guba (1985) identify the goal of sampling as being “to maximize information, the sampling is terminated when no new information is forthcoming from new sampled units: thus redundancy is the primary criterion” (Lincoln & Guba, 1985, p. 202). The redundancy in the data indicated that it was appropriate to stop adding participants.

**Type of Data Collected**

This study collected qualitative data. These data were derived from interviews with engineering managers who had been through the transition. The output from the interviews included the verbatim transcription of the interviews, notes taken during the interviews by the researcher, and observation during the interviews and at the managers’ workplace. The transcriptions were the primary raw data used in the analysis. The transcriptions consisted of the experiences, thoughts and feelings of the managers as they discussed their transition experience. The notes and observations served primarily to help the researcher during the interviews. In addition to the qualitative information, the participants provided demographic information.
Data Collection Instruments

The use of interviews has previously been discussed. This section goes into more detail about the interview structure, techniques, and question design. It also discusses the researcher as an instrument.

Interview Structure and Approach

The interview approach followed the recommendations of Seidman (1991). Each participant was interviewed three times, plus a follow-up meeting to review the results of the data analysis. Each interview lasted from one hour to one and one half hours. The goal of the interviews was to have the participants reflect on their experiences relative to the topic under discussion (Seidman, 1991). As stated previously, this was a qualitative interview study based on phenomenology. It was not truly a phenomenological study. The distinction was that complete understandings of all aspects of the transition experience were not sought. Instead, the focus was on the difficulties experienced in the transition. The perspective of phenomenology was applied to that part of the managers’ transition experience. The interviews incorporated the principles and techniques discussed below.

Interview approaches.

Patton (1990) identifies three basic approaches to qualitative interviewing. These approaches are (1) the informal conversational interview, (2) the general interview guide approach, and (3) the standardized open-ended interview. The first approach, the informal conversational interview, was described as a natural conversation with no apparent structure or predetermined course. The open-ended interview style, it was suggested,
allows the greatest flexibility. The second approach, the general interview guide interview, is designed so that the same information is gathered with each participant. The interview guide facilitates comparison of responses from participants. It presumes that pre-determined information is being sought but allows the interviewer the flexibility to probe and adapt within certain guidelines. The third approach, the standardized open-ended interview, required that the questions be prepared in advance and asked of each participant with the same wording. This approach is selected when there is a need to minimize variation among interviews, particularly when more than one person is conducting the interviews. The interview style selected for this study is discussed next.

This research utilized a mixture of the general interview guide approach and standardized open-ended. A few predetermined questions were used during each interview; however, follow-up and probing questions were utilized to explore the responses. This followed Seidman’s (1991) approach and was referred to as a semi-structured, phenomenological interview. The interview guide assisted the researcher in asking the same questions the same way for each participant. This was important for comparison of manager responses. The interview guide assured that all participants were asked the same core questions. The interview guide approach also allowed follow-up questions for clarification. For example, the researcher was free to ask follow-up questions and pursue comments which needed clarification or which presented the possibility of gaining new insights. This freedom allowed the researcher to ensure that statements by the managers were understood. The questions in the interview guide were influenced by the methodological approach and by the literature discussed in chapters one and two (McCracken, 1988; Patton, 1990; Rubin & Rubin, 1995).
The advantage of an interview guide is that it makes sure that the interviewer / evaluator has carefully decided how best to use the limited time available in an interview situation. The interview guide helps make interviewing across a number of different people more systematic and comprehensive by delimiting in advance the issues to be explored. (Patton, 1990, p. 283)

In addition, the interview guide provided the opportunity to inspect and evaluate the instrument used in the interviews prior to beginning the study. This approach provided the safeguard that "limitations of the data can be known and discussed beforehand” (Patton, 1990, p. 286).

The interview guide approach provided sufficient exposure to the managers to accurately capture the necessary insights into the challenges of their transition. The following reasons provide support for the previous statement. First, the interviews took place at the manager’s workplace. The researcher interacted with the manager in the work context. In addition, the researcher regularly interacted with other engineers and managers in the same organizations. This provided the researcher with first-hand observations of the work environment, thereby facilitating the researcher’s understanding of the culture and context of the organizations. Second, the researcher had personally made the transition from engineer to engineering manager. This provided an understanding of the issues and helped the researcher to focus on the important details and specifics. Third, the research objective and questions were focused in their scope. This led to clearly focused questions and allowed ample time to explore the information presented by the managers. Fourth, and probably most importantly, the results of the interviews and analysis were provided to the managers for feedback. The managers
endorsed the results. This validation suggested that: (1) the methods and process used to gather the data provided the necessary exposure; and (2) the researcher meaningfully captured their recollections of the transition experiences and challenges.

*Question design and interview structure.*

Question design and interview structure worked together to facilitate the gathering of information about the research topic. This section first discusses information about question design, and then examines the design and structure of the questions and interviews.

Two types of questions are presupposition and dichotomous. This study used primarily presupposition questions. This type of question presupposes that the respondent has something to say. The following quote was illustrative:

> What is the most important experience you have had in the program? This question presupposes that the respondent has had an important experience. The person of whom the question is asked, of course, has the option of responding, ‘I haven’t had any important experiences.’ However, it is more likely that the interviewee will go directly to the issue of which experience to report as important, rather than dealing first with the question of whether or not an important experience has occurred. (Patton, 1990, p. 303)

The presupposition question was in contrast with dichotomous questions, which “provide the interviewee with a grammatical structure suggesting a ‘yes’ or ‘no’ answer” (Patton, 2002, p. 354). The objective of the interview was to find out what someone had to say; presupposition questions were better at doing this (Patton, 2002). Questions are
also referred to as open or closed. A closed question has a limited number of choices for the respondent to choose from. Dichotomous and multi-choice questions are examples of closed questions. Open questions generally require explanatory answers and “permit those being interviewed to take whatever direction and use whatever words they want to express what they have to say” (Patton, 2002, p. 354).

The interview should begin with questions that will encourage the participant to talk descriptively, particularly about their experiences (Patton, 1990). The first interview was designed to help the participant discuss their manager role and relive their career development as it led them to their current job. This approach was the application of the idea Seidman (1991) refers to as the life history. Open questions were used to allow the participant to discuss the things they recalled or that seemed important to them. This allowed the participant to direct the topic of discussion and reduced researcher biases. The following statement by Patton (1990) supports Seidman’s (1991) technique of having the interviewee review their history:

> Opinions and feelings are likely to be more accurate and meaningful once the respondent has just verbally relived the experience. Thus a context is established for expressing feelings and opinions, that is, grounding feelings and opinions in relation to experiences. (p. 294)

Placing the overall career questions in the first interview prepared the participant for the following interviews by having them relive their career progression and transition to management. Questions about feelings and transition specifics were saved until the second and third interviews. The first interview generated data used primarily for
research question one. The first interview was also used to build rapport with the manager.

Interview two started to focus more on the transition experience. As with interview one, this was the application of Seidman’s (1991) idea that interview two should focus on the experiences. Open, presupposition questions were used. The participants were asked about the transition experience and what came to mind first. Because of the informed consent form, the participants knew that a main focus of the research was to understand what was challenging about the transition. It was unclear whether this influenced the fact that all the managers started talking about what they found challenging at this point. It may be that the challenges were indeed the first items that came to mind. Following the discussion of their first recollections regarding the transition, the participants were asked about their expectations, likes and dislikes for the engineer role, the manager role, and the transition process. This interview focused on research questions one and two.

The third interview used open questions focused on understanding what was challenging about the transition. This corresponds to Seidman’s (1991) interview three, where he suggests discussing the meaning of the experiences. The critical incident methodology (Flanagan, 1954) was utilized to understand what the managers each felt was the most challenging for them. The critical incident methodology suggested asking participants to select a single most critical item or experience. Question two, in interview three, implemented the critical incident approach by asking the managers the following question.
Think back to the single most difficult thing about your transition from engineer to engineering manager. It may have been something you found challenging, a barrier you faced or a situation or experience you had. It could be a single event or perhaps a new responsibility that was particularly difficult to adjust to. Please provide as much detail as you can regarding this single most difficult thing about your transition.

This question was saved until interview three. At this point in the interview process the managers had relived their career progression in interview one, and had focused on general transition topics in interview two. The managers were now ready to provide more “accurate and meaningful” (Patton, 2002, p. 294) responses. This question focused directly on research question three. Another interview question should be discussed further. Question four in interview three was tested during the pilot study and found to be particularly effective. The participants were asked what their closest friend or confidante would say, if asked what the manager found most difficult. This question was designed to surface what the manager complained or talked about the most. It was interesting to discover that, for four of the five managers, the response to this question was different from what they classified as the most challenging. This question revealed the daily irritations that they talked about, but that were not the most challenging issues. The end of the third interview was the time when questions about background and demographics were asked. Patton (1990) suggests that having the background questions at the beginning sets the precedent of short, categorical answers rather than the descriptive answers being sought.
**Interview guide.**

The previous discussion of the interview approach and question design provided details of how the interview guide was prepared. In summary, the overall structure used Seidman’s (1991) approach. Interview one provided a career history. Interview two focused on experiences and feelings. Interview three focused on the specifics of the challenges and sought to understand the meaning of the challenges for the managers. Within the framework discussed for the interviews, questions were designed using the guidelines discussed above to answer the research questions. The resulting interview guide was presented to the researcher’s dissertation committee for review. This review resulted in modifications and improvements. The interview guide was submitted to the Office of Research Protection for human subjects approval and subsequently tested in the pilot study. Minor modifications were made as a result of what was learned in the pilot study. The result of this process was the interview guide used in the study. A copy of the interview guide is in Appendix A. The interview guide shows what each interview covered and what questions were asked of all participants. The standardized questions allowed for cross case comparisons. In addition to the standard questions in the guide, other questions were asked to follow-up and probe on comments made.

**Interviews were tape recorded and transcribed.**

The interviews were tape recorded and subsequently transcribed. Taping the interview and having it transcribed increased the accuracy of the data collection. “Full transcriptions are the most desirable data to obtain” (Patton, 1990, p. 349). The transcriptions were verbatim, including incorrect grammar and filler words: this provided the raw data for analysis. However, note taking was still important. Notes helped the
researcher with follow-up questions and with staying in tune with the conversation rather
than relying solely on the recording (Patton, 1990). During the managers’ review of the
transcribed interview notes, concern was expressed about things such as incomplete
sentences and filler words such as ‘ahh’. The managers expressed concern about
appearing to have poor communication skills, even though the researcher explained that
most people do not speak in complete sentences. At the request of the participants, the
quotes as shown in this document were occasionally cleaned up. The clean up consisted
of removing filler words, such as ‘ahh’ and the use of ‘…’ to remove redundant or
unclear wording. The original, uncleaned version of the interviews was used during the
analysis.

*Researcher as Instrument*

In qualitative research, the researcher is part of the research design. The reliability
of the results is in part dependent on the effectiveness of the researcher. Personal biases,
preconceived ideas, as well as verbal communication and listening skills all are
important. This includes the ability to develop relationships and gain cooperation
(Marshall & Rossman, 1995). It is also important that the researcher provide background
information and reveal any biases so that these can be considered as part of the research
(Creswell, 1994). The researcher discusses his background and preconceived ideas
below.

The researcher had an electrical and computer engineering degree. After four
years in engineering roles, he was promoted to engineering manager. Therefore, the
researcher had personally experienced the transition from engineer to manager. This
provided the researcher with some level of expertise in the topic area. However, the industry and geographic location were different than those in the study. The experience of making the transition provided the researcher with an understanding of possible issues and an understanding of the concepts presented by the participants in the study. There was a possibility that the researcher’s personal experiences may have influenced the interpretation of comments made by the participants. This may have resulted in a bias toward the researcher’s own experiences. To protect against this, and to ensure that the results reflected the participant’s experiences, the researcher had the participants review the results of the analysis and provide feedback.

The researcher entered the research with a clear presupposition. Based on the findings in the literature, combined with researcher’s own experience, the researcher believed that the transition was difficult for engineers. The entire study made this assumption.

The researcher plays a key role as the interviewer. Therefore, the qualifications of the researcher as an interviewer are important. The researcher had experience as a professional recruiter. As an engineering manager, he was trained in interviewing. He interviewed approximately 40-50 engineers for recruiting purposes. In addition, he had numerous performance reviews and other one-on-one meetings with engineers, which provided additional interviewing skill experience. The pilot study also provided the researcher with experience in extended, very open style interviews.
Data Collection Summary

This section discusses the data collection procedures and techniques and corresponds to steps five and ten in the research process map shown in Figure 1. The study examined the experiences of individuals. The individuals were selected using criterion and typical case sampling. Interviews were conducted; the transcribed interviews were the raw data used in the data analysis. The interviews were designed and conducted to assist the participants in sharing their transition experiences, and to answer the research questions. These elements of the data collection combined to provide the quality data needed for the data analysis portion of the study.

Data Analysis

This section discusses the analysis of the data collected in the interviews. The analysis plan was originally formed in step six of the research process map shown in Figure 1. The plan was partially tested in the pilot study of step eight. Step eleven was when the complete analysis occurred. This section presents the details of step eleven. Approaches to the analysis are discussed, followed by a detailed description of the process and methods used in this study.

Data Analysis Approaches

The analysis of qualitative data is often referred to as content analysis. There are a variety of ways to approach it. Driving issues include the purpose of the research, the methods used in collecting the data, and the type of data collected. These items help determine the best approach. “Because each qualitative study is unique, the analytical approach used will be unique” (Patton, 2002, p. 433). Marshall and Rossman (1995)
suggest “five modes: [1] organizing the data; [2] generating categories, themes, and patterns; [3] testing the emergent hypothesis against the data; [4] searching for alternative explanations of the data; [5] and writing the report” (p. 113). They also discuss the concepts of data reduction and interpretation. Data reduction, as the name implies, involves organizing and reducing the data into manageable pieces. Interpretation involves identifying meaning for the data. The goal of the analysis process is that the “analysis transforms data into findings” (Patton, 2002, p. 432). The section discusses how the data analysis proceeded in this study

**Data Analysis Process and Methods**

This section goes into detail about how the data were analyzed. The analysis was done using the transcribed interviews. The first step discussed above involved organizing the data. This was done in two main phases. The first phase was a case analysis of each participant. The second phase was a cross-case analysis based on the responses of each participant to individual research questions. Once this was completed the data were reduced and organized so that the experiences and themes could be developed. Part of the theme identification involved testing the different explanations or categorizations.

**Transcriptions**

Transcriptions were the raw data that were very valuable due to the information they contained. Two different transcribers were used to convert the audio recordings of the interviews into text files. For the protection of the participants, both transcribers were asked to sign a transcription confidentiality agreement. The agreement identified the importance of the confidentiality of the participants and provided guidelines for the
transcriber to follow to protect that confidentiality. This form was approved by the Office for Research Protections and is included in Appendix A. After completion of the interviews and the transcriptions, a master copy of each interview was stored in a folder on the researcher’s computer and a printed copy was placed in a binder. Additional copies, on the computer and printed, were used for the analysis.

To locate quotes and track information back to the source in the original transcripts, the following identification system was used. The first part was the name of the manager; identifying which case it was from. This was followed by a number that indicated the interview. The next number showed the page of the interview. The final number identified which line on the page. For example, if there was a quote with the identification Don2/10/9, it was from: manager Don, second interview, page 10, starting at line 9. This identification system provided a way to keep track of all the data. The identifications remain with the quotes used in chapters 4 and 5.

Case Analysis

For each participant the case analysis had two stages. The first stage was to create a case analysis for that manager. This part of the analysis was done primarily on the computer since copying and moving quotes around was easier than with printed pages. The transcriptions were read through and the responses to each question were organized according to the interview guide questions. This involved creating a separate document and copying the potentially useful quotes into the area designated for a given research question. Generally the sections copied were large so that the context was contained with the quote. Key points were either underlined or made bold so they stood out. In situations
where a participant made statements during one question that also pertained to another question, the quote was included in both places. At this stage of the process the data had been reviewed numerous times. First, during the original interview, second, during the review of the notes following the interview, third, during the review of the notes prior to the next interview, and fourth (and fifth+) reading the transcriptions in detail to create the case analysis.

The result of stage one of the case analysis was a document with the participant responses organized according to the interview guide questions. This document was usually as long as the interviews since quotes were used in multiple places and long sections were included. However, it was clearly organized with key items underlined or bold. This document will be referred to as the in-depth case analysis.

The second stage of the case analysis was to create a second document summarizing the in-depth case analysis. In this document the concept of data reduction was important. The quotes were grouped together, duplications (discussion of the same thing in more than one place or interview) identified, and a summary of the manager responses to a give question provided. To the extent possible a one- or two-sentence quote or the key words from the quote were kept in the manager’s own wording to hold researcher influence to a minimum. The output from this second stage of the case analysis provided a three- to five-page document highlighting the manager responses. This included a summary of all of the experiences for that manager and a list of quotes about what the manager considered difficult. This will be referred to as the high-level case analysis.
The case analysis provided the initial framework and understanding of the data at the individual level. It resulted in two tools: the in-depth case analysis and the high-level case analysis. The process of developing the case analysis provided the researcher with an understanding of the participants’ experiences as portrayed in the transcribed interviews. It also provided an overview that allowed the researcher to begin to get an understanding of the large amount of data. As Patton (2002) points out “the challenge of qualitative analysis lies in making sense of massive amounts of data” (p. 432). Compared to the cross-case analysis work, the case analysis was fairly easy to do. The case analysis involved working with one manager’s comments, not all five. The comments were organized around the interview guide questions. Comments that were applicable to multiple questions were copied and organized with both interview guide questions. The case analysis was primarily a process of organizing the data for each participant by identifying the key points.

Cross Case Analysis

The next step was to compare the responses of different managers. When a new case analysis was completed, it was compared to the other completed cases. This was when the first ideas and possible groupings started to surface. It was also when patterns in experiences and what was considered difficult began to be recognized. The work previously done in the case analysis was very helpful. The high-level case analyses were compared. The in-depth case analysis was used to better understand the context as needed. The high-level case analysis results, from all of the managers, were combined together in a document on the computer, for each research question or group of related
research questions. The first things to surface from the data were the lowest level unit dealt with in the analysis—the experiences. In chapter 4 the experiences are identified and discussed in more detail. A list of experiences was created with quotes indicating which manager identified a given experience. Similar experiences began to be grouped together. This was the first step toward categorizing the experiences into themes. It was after the third case analysis was included that the data from the managers were beginning to overlap. After the fourth manager’s case study was done, and the cross-case analysis worked on, results revealed that the data were, for the most part, redundant. At this point the adjustment to the sampling was made and a fifth manager included. The fifth case analysis was completed and integrated. A more rigorous, intense effort was needed at this point in order to refine and complete the draft experiences and initial categories. This is discussed in the next section.

Experience and Theme Creation

The following ideas from Patton (1990) helped provide guidance in the creation of categories. Step one: look for recurring items. Step two: sort the items into categories. Step three: judge the categories by ‘internal homogeneity’ and ‘external heterogeneity.’ The existence of numerous items that do not fit into the categories indicates something may be wrong with the classification system. Step four: create several different classification systems. Step five: prioritize the classification systems by “salience, credibility, uniqueness, heuristic value, feasibility, special interests, and materiality” (Patton, 1990, pp. 403-404). Step six: test the categories for completeness using the following ideas:
1. The set should have internal and external plausibility … Viewed internally, the individual categories should appear to be consistent; viewed externally, the set of categories should seem to comprise a whole picture …

2. The set should be reasonably inclusive of the data and information that do exist....

3. The set should be reproducible by another competent judge....

4. The set should be credible to the persons who provided the information which the set is presumed to assimilate…. Who is in a better position to judge whether the categories appropriately reflect their issues and concerns than the people themselves? (Guba, 1978: 56-57, as quoted in Patton, 1990. p. 404)

At this point in the analysis, preliminary experiences were available with quotes for the various managers included in that experience. Almost sixty experiences were identified at this point. The experiences had anywhere from one to five managers supporting them. A preliminary grouping of experiences existed at this stage, but they were still loosely defined. Up to this point, the analysis work had been done primarily on the computer. However, trying to see the entire range of manager quotes and experiences at one time required a shift in the analysis process. The data represented a large landscape. There were many things to consider and see all at once. To handle this, the draft experiences and key quotes, including the identification of where they originated, were cut into pieces. The resulting pieces of paper took up two tables. The detail and high-level case analysis, as well as the original interviews, were on hand in order to clarify any context questions by going back to the source. It took days of dedicated effort
to review all the material. The result was that experiences were identified from the participant quotes. The wording or words of the participants were preserved in the experience title when possible. These experiences were grouped into experience categories, which became the themes. Some of the categories emerged easily; others took more re-reading of extended quotes and comparisons between the contexts of the managers. The result of the process was approximately 56 experiences, 12 themes and one category with the unassigned experiences. The ordering of the experiences within the themes reflected how many managers identified the experience. The experiences with the most managers were listed first. Other than that, the order of experiences within a theme was not important. Some experiences were only identified by one manager. The researcher acknowledges that inclusion of experiences with only one manager, do not really qualify as a common experience. However, this was done to show the full breadth of the experiences identified. In addition, this information may be useful to future researchers for comparison.

The content of the data had begun to be classified. As Patton (1990) described, the classification system was very important by providing a useful framework into which the data could be organized. Categories came directly as developed or articulated by respondents.

*Alternative Categorization, and Experience and Theme Refinement.*

The original themes came directly out of analysis of the data. It was appropriate to do as Marshall and Rossman (1995) and Patton (1990) indicated and to test alternative categorizations. The first attempt was to follow an abbreviated version of the first theme
creation. This involved looking at the experiences from a different perspective and coming up with different themes to organize the data into. This effort succeeded in the creation of a number of themes. However, there were many more unassigned experiences, and the overall thematic structure did not work as well. It seemed to fail in item 2 of Patton’s (1990) guidelines listed above: being inclusive of the data. The good ideas from this attempt were incorporated into the first set of themes and helped identify overlapping experiences. Some of the themes were refined, improved, and replaced as needed.

The second alternative categorization was the result of using a framework presented by Shenhar and Thamhain (1994) in their article, *A new mixture of management skills: Meeting the high-technology managerial challenges*. They proposed a conceptual framework that included four areas of knowledge and skills. The four areas were technical, human, operational, and strategic. The experiences were reviewed and themes created and aligned around this proposed framework. This attempt added a few insights but for the most part was an ineffective way to organize the data.

The process of alternative category creation resulted in valuable refinements to the experiences and themes. Most of the previously unassigned cases were included in themes that had been modified and now were appropriate for the experiences. Others were combined with closely related experiences. The themes and experiences were developing into useful information. The following quote by Glaser and Strauss reflects the researchers experience during the analysis. “Grounded theory (Glaser and Strauss, 1967) is a combination of inductive and deductive analysis. Inductive early in the process
while establishing concepts and then deductive as the data is re-analyzed against the framework created in the earlier phase” (quoted in Patton, 2002, p. 454).

The final test of the experiences and themes was item four identified by Patton (1990), to have the managers in the study review the results for validity. Four of the five managers agreed to have a final meeting with the researcher to review and discuss the results. The participants were provided with the transcribed interviews, the high level case analysis, and the experiences and themes. The experiences and themes the researcher had associated with each individual manager were provided as well. The managers’ first reaction to the themes was very positive. The following comment by Mark is representative of the feedback “I think you’ve captured the categories pretty well.”

Specific questioning by the researcher led to some improvements and useful suggestions from the managers. The managers were presented with the eleven themes the researcher had identified using the procedures outlined above. Each manager numbered these themes according to difficulty for them personally. Some managers indicated that they agreed with some themes as being something they experienced but did not find difficult. These items were therefore not given a difficulty ranking. The researcher discussed the themes and possible options for expanding the themes or reducing them.

Based on the feedback of the managers, two themes were combined into other existing themes. First, the closely intertwined concepts of delegation and letting go of the technical were combined to create Theme 3. Second, a theme containing human resource experiences was incorporated into two of themes. Those themes were relationships (Theme 2) and organizational (Theme 9). This combination meant one experience was combined with experience 2.4. One experience became experience 2.8. One final
experience became experience 9.4. The validity check by the managers was very important; it provided essential support for the validity of the findings. In addition to the check on the validity of the themes and experiences, the managers were asked to order the themes in terms of difficulty for them personally. The fifth manager, Larry, who was unable to meet to review the analysis in detail, did respond via email with a theme ranking. The results of the ranking are discussed in chapter 4.

The manager rankings raised one item as important to discuss. The comparison of what the managers indicated was the most difficult during the interviews, and what they indicated as most difficult in the ranking, surfaced one discrepancy. During the interviews, Ron identified relationship issues (Theme 2) as most difficult, followed by Theme 1 and then Theme 3. However, in the ranking he switched his most difficult and his second most difficult. So the rankings show Theme 1 as his most difficult and Theme 2 as his second most difficult. The researcher did not find qualitative research sources that provided guidance for this sort of dilemma. He handled this by presenting the interview based “most difficult”, Theme 2, in chapter 4 with a note that the rankings suggested Theme 1. An exception was made in the discussion of the rankings. When the rankings were discussed, Theme 1, as ranked by Ron, is listed as most difficult. The reasoning behind this approach is that the interviews were structured such that the manager relived the transition and had the details fresh in his mind. The ranking was done many months later. Therefore, the answer provided during the interviews was believed to be more grounded in actual experience.
Summary of Data Analysis

The data analysis section has presented details on the analysis process and methods. This corresponds to step eleven of the research process map shown in Figure 1. The transcriptions were identified as the raw data used in the analysis process. The steps of doing the case and cross-case analysis were detailed. The creation and testing of the experiences and themes was discussed. This section demonstrates the careful attention to detail and the efforts used to provide good analysis: turning the data into useful and meaningful information.

Verifying Quality of the Study

This section reviews some of the considerations supporting the quality of the study. The concepts of credibility, reliability, and transferability are discussed. This section corresponds to step twelve in Figure 1.

Credibility and Reliability

Credibility corresponds to the concept of validity. Reliability is considered the extent to which an instrument measures what it is supposed to measure (Ary, Jacobs, & Razavieh, 1996). Reliability is also related to the idea of repeatability. In speaking specifically about qualitative methods, Patton (1990) focuses on the term credibility. Credibility indicates that the study’s findings are true for the study’s participants. Reliability suggests the study measured what it intended and could be reproduced. The following discussion provides support for both considerations.

This study employed numerous techniques, particularly triangulation, to enhance the credibility and reliability. The details of the study’s process and methods were
provided for review. These include characteristics used to identify participants, the interview question guide, and details of the analysis process. This allowed others to review how the study was conducted. Five triangulation techniques were employed. First, a triangulation technique, suggested by Patton (2002), was to evaluate alternative approaches to categorizing the data. As discussed in the data analysis section, multiple approaches to categorizing the data were assessed. Second, analytical triangulation was also used. “Having those who were studied review the findings offers another approach to analytical triangulation” (Patton, 2002, p. 560). Four of the five participants met with the researcher to review the results of the analysis. Glesne (1999) discussed the value of this. “Obtaining the reactions of respondents to your working drafts is time-consuming, but respondents may (1) verify that you have reflected their perspective; (2) inform you of sections that, if published, could be problematic for either personal or political reasons; and (3) help you to develop new ideas and interpretations” (p. 152). Lincoln and Guba (1985) suggested that the technique of testing the results with participants or members of the group being studied was the most crucial test in establishing credibility. The third technique employed was the use of multiple data sources. The sources included multiple participants, combining interview data with field notes, and observations. The fourth technique was the comparison of the results with the findings from Hill’s (1993) study. This study was described in chapter 2. The findings supported each other and further validated the study. More information about this comparison is provided in chapter five. The fifth triangulation method was that the researcher, having made the transition personally, was able to review the results and verify that they were valid based upon personal experience. In summary, providing the details of the study design and the
methods of triangulation discussed above, combined to support the credibility and reliability of the study.

As an additional test of credibility, an external methodology review of this study was conducted. The reviewer has a Ph.D. in Sociology from Indiana University and is an assistant professor at a northeastern university. The reviewer teaches graduate courses in qualitative research methods and has been published in *Social Psychology Quarterly*, the *Journal of Sociology and Social Welfare*, *Motivation and Emotion*, and the *Community Mental Health Journal*. In addition, the methodology reviewer is an article reviewer for: *Social Psychology Quarterly*, *American Journal of Sociology*, and *Symbolic Interaction*. She has served as an outside reviewer for the National Science Foundation. In her review of the methodology for this study, the reviewer stated that ‘the discussion of the methods and procedures was very thorough’ and expressed no concerns about the quality of the study. The reviewer felt it important that the study be identified as ‘exploratory’ and its nature ‘inappropriate for quantitative methods.’ The number of participants was discussed; the reviewer stated that the addition of further participants, using the selection criteria, would have resulted in further redundant data. This review further supports decisions made about the methods selected for this study and the credibility of its process.

*Transferability*

Transferability refers to how the findings in a study can be transferred or applied to similar situations. Lincoln and Guba (1985) espouse this insight: “The degree of *transferability* is a direct function of the similarity between the two contexts” (p. 124).
The study must provide the details of the context and methodology in order for researchers who desire to transfer the finding, to make informed decisions (Lincoln and Guba, 1985). However, the researchers who seek to do the transfer are responsible for establishing its appropriateness for their studies.

The research attempted to enhance the quality and transferability of the study by including detail directly from the participants in the form of interview quotes. Marshall and Rossman (1995) support this approach when listing criteria to increase the quality of a study. They recommend “abundant evidence from the raw data” (p. 147). The following statement by Patton (2002) further demonstrates the value of using the data directly from the source when possible.

Rich, detailed, and concrete descriptions of people and places – ‘thick description’ (Geertz 1973; Denzin 2001) – in such a way that we can understand the phenomenon studied and draw our own interpretations about meanings and significance. (p. 438)

Using many participant quotes allowed the participants in the study to speak for themselves. Researchers studying different topics can consider the quotes from the framework of their research and better determine the transferability.

**Summary of Verification of the Study’s Quality**

This section has supported the quality of this study, and therefore corresponds to step twelve in the research process map shown in Figure 1. The issues of credibility, reliability and transferability have been discussed. Supporting items for each have been presented.
Methodological Limitations

The results of this study are limited in ways common to qualitative studies. The results are not generalizable to a larger population. The results “are generalizable to theoretical propositions and not to populations or universes” (Yin, 1994, p. 10). In addition, the study is a qualitative interview study based in the tradition of phenomenology. The research questions focus on certain aspects of the phenomenon of the transition. Therefore, it is not expected that the results will accurately represent the overall essence of the transition, but rather that portion which the research questions focused on. All of the managers in the study were male. The researcher did not deliberately select male managers. Rather, the sampling criteria were used to select participants. During the process of finding participants, one female manager was referred to the researcher. However, she did not wish to participate in the study. This may be a limitation of the study, and represent a bias toward the male transition experience.

Chapter Summary

In summary, this chapter has discussed the research methodology. The process followed during the study is presented in Figure 1. First, steps one through four were discussed. These steps covered the rationale for using the qualitative methods selected. Next, steps five and ten presented the details of the data collection and identified the techniques used during the interviews. Next, steps six and eleven were discussed to present the details of the data analysis. Following the data analysis section, step twelve, the quality of the study, was addressed in terms of credibility, reliability, and
transferability. Finally, the methodological limitations of the study were addressed. The next chapter presents the results of the process of collecting and analyzing the data.
CHAPTER 4

Study Results

The purpose of this study was to gain a better understanding of what engineering managers experienced and found challenging about the transition from engineer to manager. This chapter presents the results of the data collection and analysis described in chapter 3. The results are organized according to the research questions. Figure 2 shows the process and data flow used in gathering and preparing the data presented in this chapter. Before discussing the research question results, there is a brief review of the procedures and a restatement of the research questions. Then research question 1 is addressed by presenting a case summary for each participant, followed by cross-case comparisons. This is followed by the presentation of the results for research question 2. The experiences identified by the managers are presented. They are organized within the themes that surfaced during the data analysis. The chapter concludes with the results for research question 3. The themes are ranked in order of difficulty according to the managers’ feedback.

Summary of Procedures

The participants for the study were in engineering manager roles at aerospace companies on Long Island, New York. Prospective participants were screened using the participant selection guide (see Appendix A). The procedures used with each participant are provided here. Following the initial discussions, interested participants who met the
sampling criteria were sent the Informed Consent Form (ICF) and the first interview was scheduled. At the first interview the ICF was discussed and any questions answered. The interviews were then conducted by following the interview guides and asking follow-up questions as needed. The interviews were held at the manager’s place of work and were generally spaced from one week to a few weeks apart, as the manager’s schedule permitted. After the interviews were completed and transcribed for each manager, a case analysis was prepared. As case studies were completed they were compared to the other completed cases. The analysis proceeded until all the data were collected. The discovery and inclusion of managers occurred over a period of about one year. Once the data had been collected and analyzed, the findings were prepared and presented to the managers in a follow-up meeting. Prior to the meeting, the managers were given complete copies of the transcribed interviews. They were also provided with the high-level case analysis, the list of experiences and themes, and which experiences had been attributed to them. In the follow-up meeting, the results, experiences, and themes were discussed with the manager. The manager was asked about the validity of the findings based on their transition experience. In addition, the manager was asked to rank the themes according to challenge or difficulty.

The overall research objective was to understand what was challenging about the transition from engineer to engineering manager for the managers in the study. To achieve this objective, the nature of the transition for the managers in the study was examined in terms of the following research questions.

1. What is the job-related context of the managers during the transition from engineer to engineering manager? Specifically, what are the managerial job functions,
career progression, likes and dislikes about their engineering and manager roles, and the timing and duration of the transition, in order to understand the context for the experiences and challenges explored in questions two and three?

2. What are common experiences for engineers who transition to engineering manager?

3. What did engineering managers find most challenging or difficult about the transition from engineer to engineering manager?

Data from the interviews were referenced to the source using the format discussed in chapter 3: Name Interview/Page/Line, for example Don1/2/3 is interview one, page two, line three with Don. For quotes, the location of the first line was indicated. In the discussion of research question 1, a few sections contain summarized lists from pages of interview data. In those cases, a range of interview data was provided to indicate where the results were drawn from. The process model, Figure 2, is presented, followed by the results for each research question.
Study Focus:
Engineering Manager
Transitions: Experiences and Challenges

Organization of Chapter 4
Study Purpose
Participant Profile
Procedures

Research Question 1

Research Question 2

Research Question 3

Interview Guide 1

Interview Guide 2

Interview Guide 3

Transition Context
and Manager Profiles

Common Experiences

Most Difficult

Themes

Manager Validation
and Ranking

Chapter 5
Conclusions and Recommendation

Figure 2. Process model for analysis and chapter 4.
In the presentation of the data that follows, extensive quotes are used as reported directly by the managers. This follows Wolcott’s (1994) recommendation to allow the participants to speak for themselves. In a few cases, particularly in the case summaries, large sections have the key words or points summarized, but even in these cases, when possible, the words of the participants were used. As discussed in more detail in chapter 3, the quotes were cleaned up, as requested by the managers. This cleaning consisted of removing filler words such as ‘ahhh’ and using ‘…’ to remove redundant or wordy sections.

Research Question 1

*What is the job-related context of the managers during the transition from engineer to engineering manager? Specifically, what are the managerial job functions, career progression, likes and dislikes about their engineering and manager roles, and the timing and duration of the transition, in order to understand the context for the experiences and challenges explored in questions two and three?*

This section presents the results for research question 1. A profile or case is provided with details about each manager. Data from the first and second interviews provided the source for most of the information below. Each manager is considered separately. Demographic information about the managers is provided separately.

**Case Context Summaries**

The participants in the study were five engineering managers. The managers were from three aerospace companies with offices located on Long Island, New York.
In this section case studies are presented for each of the participants. The purpose of the case studies was to establish some background and context for understanding the experiences and challenges discussed in the other sections. Each case contains information about one of the participants. The information presented includes demographic information and an overview of information relative to understanding certain aspects of the transition. The aspects discussed include: managerial job function; how the managers career progressed; things they indicated that they liked and disliked about the engineer role, manager role, and the transition; comments about the transition; and what they indicated as the most challenging thing about the transition, as identified during the interviews. Following the individual case discussions, a cross-case discussion covers some patterns identified that are not covered in the other research questions.

Don

For the purposes of the study, the name of this manager will be Delegation Don. This name reflects the major challenge this manager had with experiences related to delegating technical work rather than doing the work himself. The following discussion covers the overview of Don’s comments relative to research question 1.

Managerial job function

Don’s formal title was Project Engineer. The Project Engineer was the first level of management at his company. The following were the key phrases and words he used to describe this role:

A Project Engineer is a catch all phrase for somebody who is responsible for making sure everything gets done.... Coordinating all the technical disciplines...
in terms of electrical design, mechanical design, printed circuit board design, test and integration. Also test equipment, test equipment design, fabrication and ultimate integration with the unit.... Responsible for both technical … and also administrative. Taking care of schedule, budgets, that kind of stuff.... I review other peoples designs and I look and see what they did and I say well you know that’s not good or this is a better way to do it and I try to help them that way. But I’m not responsible for any technical design myself anymore.

(Don1/1/16 - Don1/2/6)

This quote from Don shows that he was responsible for coordination of all aspects of one or more projects. That included managing the day-to-day efforts of the engineers, schedules, budgets and review of the product design. He was not responsible for doing any actual technical design work.

*Time percentages*

Table 2 indicates how Don described the allocation of his time.
Table 2

*Don’s Activities and Time Percentages*

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Organizing, coordinating and ensuring that parts of the project are progressing</td>
<td>55%</td>
</tr>
<tr>
<td>2. Communication</td>
<td>20%</td>
</tr>
<tr>
<td>3. Budgets</td>
<td>15%</td>
</tr>
<tr>
<td>4. Meetings &amp; misc.</td>
<td>10%</td>
</tr>
</tbody>
</table>

*Note.* Source Don1/2/47 – Don1/3/38.

*People Reporting to Delegation Don*

Nine people reported to Don as technical members of projects. He did the day-to-day management of their activities. They formally reported to line managers. He was involved with their reviews but did not make direct decisions about salary. The number of engineers reporting to him had increased over time but varied depending on the projects. The highest was twelve on a project he managed a couple years ago. (Don 1/3/45- Don1/5/1)

*Career Progression*

The following is an overview of Don’s career, with the time spent in three primary phases.

Phase 1: Design Engineer - Eight years as a design engineer with no supervisory/management role.

Phase 2: Transitional Manager - Thirteen years with a combination of design and supervisory/management role. The supervisory/management role increased over time.
Phase 3: Project Engineer/Engineering Manager - Two years as Project Engineer/Engineering Manager with no design work. (Don1/5/30 - Don1/8/23)

*Likes and dislikes relative to the transition*

Each of the managers was asked about likes and dislikes relative to the engineer role, manager role, and the transition. Table 3 contains short quotes or summaries of Don’s comments regarding each.
<table>
<thead>
<tr>
<th>Manager comment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Table 3</strong> Don’s Likes and Dislikes about Engineer, Manager and the Transition</td>
</tr>
<tr>
<td><strong>Manager comment</strong></td>
</tr>
<tr>
<td><strong>Liked about being an Engineer</strong></td>
</tr>
<tr>
<td>Creating something</td>
</tr>
<tr>
<td>Solving a problem</td>
</tr>
<tr>
<td>[Ownership of solution]: I did that, that’s mine.</td>
</tr>
<tr>
<td>Having a single task to focus on</td>
</tr>
<tr>
<td>[Getting it 100% correct]: working on the one thing and get it right</td>
</tr>
<tr>
<td><strong>Disliked about being an Engineer</strong></td>
</tr>
<tr>
<td>[Did not control his fate]: other people telling me what to do and when to do it</td>
</tr>
<tr>
<td>Did not have control of the whole project. Even if his part was good, if another</td>
</tr>
<tr>
<td>engineers portion was not well done it reflected on the whole project</td>
</tr>
<tr>
<td>Limited in career. Going into management only real way to progress</td>
</tr>
<tr>
<td><strong>Liked about being an Engineering Manager</strong></td>
</tr>
<tr>
<td>Having more responsibility</td>
</tr>
<tr>
<td>Broader knowledge: although technical design skills have diminished his overall</td>
</tr>
<tr>
<td>knowledge of broader product has increase. As well as understanding the steps and</td>
</tr>
<tr>
<td>phases of a products lifecycle.</td>
</tr>
<tr>
<td>Viewed as an expert for this broader knowledge and others seek his input and advice</td>
</tr>
<tr>
<td><strong>Disliked about being an Engineering Manager</strong></td>
</tr>
<tr>
<td>Not being able to focus or see one thing through to its completion.</td>
</tr>
<tr>
<td>Going for a 90% solution instead of 100% because you have to move on</td>
</tr>
<tr>
<td>No longer one of the group with the engineers. Sometimes viewed as the enemy. Not</td>
</tr>
<tr>
<td>the same friendship</td>
</tr>
<tr>
<td>No longer creating</td>
</tr>
<tr>
<td>Doesn’t feel ownership</td>
</tr>
<tr>
<td>Did not get to control things as much as he expected since customer demands and</td>
</tr>
<tr>
<td>corporate strategy take precedence</td>
</tr>
</tbody>
</table>
Liked about transition

- Getting the chance to do it. Had aspired to this role, even though it ended up being harder than expected
- Like the results but [not really the process]
- Given more responsibility
- Sangled out [from others to do this]: I was doing a good job
- First step in the progression up the corporate ladder

Disliked about transition

- Thrown into it
- Trial by fire
- I felt very frustrated.
- No training and very poor role models

Note. Source: Don2/6/22 - Don2/9/12. The statements above are short quotes or summaries of Don’s comments regarding each aspect.

Comments about the transition

The following was an insightful statement reflecting Don’s perspective and feelings regarding the transition:

When I was first going through the transition, as I explained before, I felt very frustrated. I didn’t like the idea that I had received no training and very poor role models to go by in performing this transition. I was basically just thrown into it. One day they looked around and they didn’t have anybody to run the job and they said, hey you do it.... I was just kind of thrown into it. So that was basically what I didn’t like.... trial by fire. You’re just thrown into it and that’s it. (Don/2/8/28)
The previous quote from Don shows that he described the transition as frustrating. He felt like he was ‘thrown into it,’ and that this was a ‘trial by fire.’

The following quote was how Don defined the transition from his personal experience. His definition reflects what he found most challenging: delegation and leaving the technical behind:

The transition was when I stopped doing actual engineering work and I just reviewed or expedited the work of [others]. (Don1/8/39)

*Most challenging thing about the transition*

The most challenging thing for Don was Theme 3: Delegation. Don struggled with the fact that he had to work through others to get things done. See the section on research question 3 for detailed quotes.

*Summary for Don*

Delegation Don was a Project Engineer who spent eight years as a design engineer, thirteen years doing a mixture of engineering and managerial/supervisory tasks, and had been a manager for two years. He found delegation and leaving behind the technical to be the most challenging aspect of the transition from engineer to manager.

*Mark*

For this study, the name for this manager will be Multi-faceted Mark. This name was selected because of the challenge he faced with the multi-faceted nature of the engineering manager role. The following discussion covers the overview of Mark’s comments relative to research question 1.
Managerial job function

Mark’s formal title was Program Manager. He described his role in the following quote:

Monitoring man-hours … financial aspects … Predicting manpower needed, … Bids and proposals … Interfacing with production … Customer site visits … Mediation of personnel issues … Presentations for customer … Program management review status … Financial reports … Technical reports on project status. (Mark1/2/48-Mark1/3/20)

The main functions of his job included managing various aspects of the engineering work, such as monitoring engineering hours and financial aspects, doing proposals, working with the customer, and reporting status to the rest of management.

Time percentages

Mark identified his time as 90% managerial and 10% non-managerial. The following is the breakdown of the managerial time.
Table 4  
*Mark’s Activities and Time Percentages*

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reporting finances of projects</td>
<td>45</td>
</tr>
<tr>
<td>Forecasting bids, proposals and specs</td>
<td>20</td>
</tr>
<tr>
<td>Program management review</td>
<td>10</td>
</tr>
<tr>
<td>Mediation of personnel issues</td>
<td>8-10</td>
</tr>
<tr>
<td>Interaction with production</td>
<td>6-8</td>
</tr>
<tr>
<td>Customer site visits</td>
<td>6</td>
</tr>
<tr>
<td>Reviewing engineering documentation</td>
<td>3</td>
</tr>
</tbody>
</table>

*Note.* Source Mark1/3/22- Mark1/6/36.

*People Reporting to Multi-faceted Mark*

At one point, 65 people worked on Mark’s projects. At the time of the interviews the number of engineers was down to nine. The engineers who report to him did so indirectly. A line manager handled the formal management aspects such as raises. Mark was responsible for the allocation of the engineer’s work on his projects. This included hours spent on the project and money spent on equipment, parts and other expenses (Mark1/7/19- Mark1/8/15).

*Career Progression*

Mark’s career progression is shown below, identifying the time spent in three main phases.

Phase 1: Technical Contributor as technician and then engineer - Fifteen years with primary responsibility for technical contribution/design.
Phase 2: Transitional Manager - Ten years with a combination of design, administrative and supervisory/management roles. Did not have formal title for management role.

Phase 3: Program Manager - Four years with formal Program Manager role with no technical design role (Mark1/8/17- Mark1/13/45).

Likes and dislikes

Each of the managers was asked about likes and dislikes relative to the engineer role, manager role, and the transition. Table 5 presents short quotes or summaries of Mark’s comments regarding each.
Table 5

*Mark’s Likes and Dislikes about Engineer, Manager and the Transition*

<table>
<thead>
<tr>
<th>Manager comment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Liked about being Engineer</strong></td>
</tr>
<tr>
<td>Solving problems</td>
</tr>
<tr>
<td>Creating something</td>
</tr>
<tr>
<td>Sense of accomplishment in seeing what he created used and successful in the field</td>
</tr>
<tr>
<td>Hand’s on work</td>
</tr>
<tr>
<td>Teamwork and working with others at same level</td>
</tr>
<tr>
<td><strong>Disliked about being Engineer</strong></td>
</tr>
<tr>
<td>Deadlines and schedules: management set them and they were unrealistic</td>
</tr>
<tr>
<td>Wanted to know what management knew: understand bigger picture, be more involved in bigger picture</td>
</tr>
<tr>
<td>Constant work to keep on the leading edge of technology</td>
</tr>
<tr>
<td>Pressure resulting from scheduling by management: didn’t like the pressure</td>
</tr>
<tr>
<td><strong>Liked about being a Manager</strong></td>
</tr>
<tr>
<td>Had his own project to run</td>
</tr>
<tr>
<td>Customer interactions: interfacing, relationship development, discovering needs</td>
</tr>
<tr>
<td>Learning more of the business: financial, schedules, and production</td>
</tr>
<tr>
<td>Respect: people knowing you’re in a responsible position, knowing you’re capable</td>
</tr>
<tr>
<td>People: being able to motivate people, having good people working for you</td>
</tr>
<tr>
<td>Felt like it was a step forward in his career</td>
</tr>
<tr>
<td><strong>Disliked about being a Manager</strong></td>
</tr>
<tr>
<td>Technical: losing skills, no longer honed, can’t dabble in</td>
</tr>
<tr>
<td>Must come in right on budget</td>
</tr>
<tr>
<td>Being in middle between customer and company</td>
</tr>
<tr>
<td>If customer likes you then you’re in a good position, otherwise, big trouble</td>
</tr>
<tr>
<td>Other managers always knowing more and telling him what to do like he is a novice</td>
</tr>
<tr>
<td>Not being the expert anymore</td>
</tr>
<tr>
<td>Upper managers that don’t want to work with you or not open to new ideas</td>
</tr>
</tbody>
</table>
If something goes wrong it all you, if it goes right, upper management takes credit
Upper management actions reflect on you for good or bad
Having so many areas of responsibility and balancing them all simultaneously
Interruptions taking him away from a task
Trade-offs
Extra hours worked to get things done

Liked about the transition
Developed and learned via difficult experiences
Accomplishing something others said would be difficult

Disliked about transition
Starting out you don’t know what you’re supposed to be doing
Perception of others that you don’t know what you are doing
Competition: others fighting to get up ladder no one willing to help you
No mentoring to point out pitfalls to avoid
School of hard knocks
Thought things were good then … wham out of the blue something whacks him.

Note. Source: Mark3/1/6 - Mark3/7/30. The statements above are short quotes or summaries of Mark’s comments regarding each aspect.

Comments about the transition

The following statements from Mark provide insight into his experience during the transition:

I felt that I knew everything about what I needed to know. And it turns out I didn’t. I thought my boss was just not managing properly. I judged him, improperly, because once I became involved in all of the aspects of business, I found that I probably didn’t have enough expertise and enough savvy to be able to handle all of the things that I need to handle. Being an actual Program
Manager, I thought it would be easier than what it was. It turned out to be a real, I mean; I said I know the technical, I know how to do the budgets and the finance part of it, for the most part. It shouldn’t be that difficult but all the politics, the political issues, financial issues, the contractual issues, initially was very overwhelming. It was like a different world coming from an engineer into that environment. (Mark1/14/10)

This quote shows that Mark thought the transition would be easier than it turned out to be. He felt like management was a different world compared to engineering:

Not really that many easy things. It’s a tough transition. I found it to be tough. My perception of it was that it would be easier than what it was when I got there. (Mark4/9/37)

This quote shows that for Mark it was a tough transition.

Most challenging thing about the transition

The most challenging thing for Mark was Theme 1: Too much going on: Multiple things to focus on and balance. Mark struggled with trying to understand the many different aspects of the management role; there was much to understand all at once. See the section on research question 3 for detailed quotes.

Summary for Mark

Multi-faceted Mark was a Program Manager who spent fifteen years as a technical contributor, ten years in transitional roles combining technical and managerial aspects. He had been a Program Manager for four years. He found the multi-faceted
nature of the job with so much going on, Theme 1, the most challenging aspect of the transition.

Larry

The name Layoff Larry was selected for this manager. As a new manager he was involved in a layoff that affected engineers he had recently worked with. The following discussion identifies the information from Larry relative to research question one.

Managerial job function

Larry’s formal title was Program Manager. He describes the responsibilities and actions for this position in the following quote:

Overseeing the budget … controlling the daily-weekly-monthly progress of the task that we’re currently involved in, reporting the status to the corporate hierarchy…. Coordination … communication …staffing/resource allocation …evaluations … preparation for meetings/presentations … handling corporate requests … staff meetings … meeting with his direct reports … responding to [request for quote]. (Larry1/1/6 - Larry1/3/12)

The statement above by Larry shows that he was responsible for budgets, engineering resource coordination and allocation, and communication with engineers and other managers.

Time percentages

Larry provided the following comment and breakdown of a typical 11-12 hour day to represent how his time was used. “A lot of meetings. A lot. More meetings than I care to go to” (Larry1/3/12).
Table 6

*Sample Day for Larry with Time and Percentage for each Activity*

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status meetings and handling issues</td>
<td>5-6</td>
<td>50</td>
</tr>
<tr>
<td>Phone communicating with other divisions</td>
<td>1-2</td>
<td>8-17</td>
</tr>
<tr>
<td>Email</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Meeting with Facility Manager</td>
<td>0.5-1</td>
<td>4-8</td>
</tr>
<tr>
<td>Other items described in job function section above</td>
<td>2</td>
<td>17</td>
</tr>
</tbody>
</table>

*Note.* Source Larry1/3/12 - Larry1/7/41.

*People reporting to Layoff Larry*

Larry has 34 engineers who reported to him. He had formal responsibility for performance reviews and salary decisions (Larry1/1/30 & 1/7/52).

*Career Progression*

The progression of Larry’s career is shown below. Larry was the only engineering manager in the study who did not have an extended transition.

Phase 1: Engineer - Eleven years as engineer doing mostly design work.

Phase 2: Lead Engineer - Fourteen years as a Lead Engineer doing design work and minor coordination with other engineers.

Phase 3: Manager - Two years as Manager (Larry1/8/13 - Larry1/11/20).
Likes and dislikes

Each of the managers was asked about likes and dislikes relative to the engineer role, manager role, and the transition. Table 7 presents short quotes or summaries of Larry’s comments regarding each.

Table 7
Larry’s Likes and Dislikes about Engineer, Manager and the Transition

<table>
<thead>
<tr>
<th>Manager comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liked about being Engineer</td>
</tr>
<tr>
<td>Lab work</td>
</tr>
<tr>
<td>Solving problems, debugging, and troubleshooting</td>
</tr>
<tr>
<td>Working with lab equipment</td>
</tr>
<tr>
<td>Ownership</td>
</tr>
<tr>
<td>Lots of responsibility</td>
</tr>
<tr>
<td>Disliked about being Engineer</td>
</tr>
<tr>
<td>Reports, status updates</td>
</tr>
<tr>
<td>Likes about being a Manager</td>
</tr>
<tr>
<td>Brokering an agreement / negotiating a win/win</td>
</tr>
<tr>
<td>Disliked about being a Manager</td>
</tr>
<tr>
<td>Employee evaluations</td>
</tr>
<tr>
<td>HR Aspects</td>
</tr>
<tr>
<td>Endless Meetings, sometimes with no resolution to problems</td>
</tr>
<tr>
<td>Liked about the transition</td>
</tr>
<tr>
<td>Involved in decision making</td>
</tr>
<tr>
<td>Know what’s going on</td>
</tr>
<tr>
<td>Disliked about transition</td>
</tr>
<tr>
<td>Relationship change with engineers</td>
</tr>
</tbody>
</table>

Note. Source: Larry 2/7/14 - Larry 2/11/17. The statements above are short quotes or summaries of Larry’s comments regarding each aspect.
Comments about the transition

The following quote from Larry provides insight into some of the thoughts and experiences he had in the transition:

After making the decision there was also the transitional phase, you know, working through all that and the uncomfortableness of, of going through it. Almost like walking on eggshells for a while, you know. You’re not quite sure—you’re still thinking like an engineer, you’re still thinking like, uh, ‘Gee, if I could only do this job myself I’d get it done faster.’ But you can’t. So, you know. You’re still thinking like you want to do the job, but you can’t really do the job. You now have to delegate and try to manage and coordinate, and control it from a different aspect and that’s, that sometimes is a big transition.

(Larry2/1/21)

The quote just presented shows that Larry had a period in the transition where he was uncomfortable. He was still thinking like an engineer but now he had to learn to think and act like a manager. For Larry that change was a big transition.

This next quote really stands out as a good assessment of the transition into management. It also shares some of the input Larry was getting as he made the decision to transition into management:

We always had a joke in this place that the worst position in this company was first line supervision. Because you got it from both ends. You got it from the guys on top and you got it from the guys underneath! They’re stuck in the middle. And, uh, an old manager that I worked for fifteen or 20 years ago told
me, ‘If you don’t think you can break through that first layer of management, don’t even make the attempt,’ he says, ‘Cause you’ll kill yourself!’

(Larry2/12/22)

This statement by Larry highlights the difficulty of the first line supervision position.

When asked ‘If you had to make the decision over again, would you do it?’ Larry responded as the next quote indicates. Keep in mind that this answer was given after more than a year in the manager role:

My gut response is ‘No, I would not do it over again.’ That’s my gut response, ok? But I know in the long run, it was the right decision. (Larry2/10/27)

*Most challenging thing about the transition*

The most challenging thing for Larry was Theme 2: Relationship issues. Larry had to lay off a number of engineers he had worked with for years. He understood the personal effect that doing so would have on his former peers. It was a real challenge for him. See the section on research question 3 for detailed quotes.

*Summary for Larry*

Larry was a Program Manager who spent twenty-five years in primarily technical roles. When interviewed, he had been a manager for two years. During the interviews he identified the personal relationship aspect of the transition to manager as the most challenging thing.
This manager is named Relationship Ron. During the interviews, he identified the peer-subordinate relationship as the most challenging. The discussion and quotes below provide background on research question 1 and identify his biggest challenge.

Managerial job function

Ron’s formal title was Project Engineer. The following was his discussion of this role:

Currently I’m what they call a Project Engineer. I’m an engineering manager. More accurately, I’m responsible for the engineering on the project.... Maintaining schedules … to the engineers that report to me, it’s maintaining schedules, assigning work, dictating their priorities … Assigning the resources that are assigned to me, and … (pause) giving them basically their work assignments, be it, you know, daily or weekly, assigning how they should conduct themselves, based on the program requirements at the time.

(Ron1/1/13 - Ron1/3/39)

The statement by Ron shows that he was responsible for the engineering on a project. He did not do the technical work but he maintained schedules, assigned work, and communicated with management.

Time Percentages

Ron discussed his time usage as shown in Table 8.
Table 8

*Ron’s Activities and Time Percentages*

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reporting to higher levels - “Almost 100% of that is in meetings.”</td>
<td>60-70</td>
</tr>
<tr>
<td>Interfacing down: “I have a daily staff meeting where we sit and</td>
<td>30-40</td>
</tr>
<tr>
<td>talk about what’s going on [with] the program … call [engineer(s)]</td>
<td></td>
</tr>
<tr>
<td>into my office and we’ll talk about something or go over</td>
<td></td>
</tr>
<tr>
<td>something.”</td>
<td></td>
</tr>
</tbody>
</table>


*People reporting to Relationship Ron*

At the time of the interviews, six people reported to Ron. The number of engineers was as high as fifteen. The number varied depending on the needs of the project. Administratively they reported to a line manager but he managed their day-to-day work and had the “lion’s share” (Ron1/4/2) of the input on performance reviews.

*Career Progression*

Ron’s career progression is outlined as shown below.

Phase 1: Engineer - 14 years in engineering roles: field engineer, production engineer, and instructional engineer.

Phase 2: Transitional Manager - 6.5 years as senior engineer and deputy engineering manager.

Phase 3: Engineering Manager - 1.5 years as formal engineering manager with no design work (Ron1/5/3 - Ron1/8/50).
Likes and dislikes

Each of the managers was asked about likes and dislikes relative to the engineer role, manager role, and the transition. Table 9 provides short quotes or summaries of Ron’s comments regarding each.

Table 9
Ron’s Likes and Dislikes about Engineer, Manager and the Transition

<table>
<thead>
<tr>
<th>Manager comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liked about being Engineer</td>
</tr>
<tr>
<td>Liked being expert in one area: go to guy</td>
</tr>
<tr>
<td>Disliked about being Engineer</td>
</tr>
<tr>
<td>Don’t see big picture</td>
</tr>
<tr>
<td>Liked about being a Manager</td>
</tr>
<tr>
<td>Likes Higher-level involvement</td>
</tr>
<tr>
<td>Doesn’t miss being technical</td>
</tr>
<tr>
<td>Enjoys interacting with people at higher level</td>
</tr>
<tr>
<td>Disliked about being a Manager</td>
</tr>
<tr>
<td>Being firm with engineers</td>
</tr>
<tr>
<td>Liked about the transition</td>
</tr>
<tr>
<td>Same as liked about manager</td>
</tr>
<tr>
<td>Disliked about transition</td>
</tr>
<tr>
<td>Same as disliked about manager</td>
</tr>
</tbody>
</table>

Note. Source: Ron3/7/44 and interview two notes. The statements above are short quotes or summaries of Ron’s comments regarding each aspect.

Comments about the transition

Ron identified the transition with a mindset change. This mindset change occurred when he stopped doing the technical work. He had to stop getting involved with the
“hardware” or the equipment and actual design of the product. Here’s how he described it:

That’s the transition. And it’s the realization that—I don’t know if I’ve said this before. It might sound funny—but you can’t work and manage at the same time. You have to either work or you have to manage. Ok? And it means laying off the equipment, you know? I think I’d say as a developing manager from an engineer. The first step is to, uh, is to either delve into the design or keep your hands on the hardware on the bench. Right? You can’t do that! You absolutely can’t do that and be a manager at the same time. You just don’t have that, the luxury of that kind of time to do everything. Ok? So that’s certainly a different mindset. That’s certainly a different mindset that you can’t stay in the lab or you can’t keep your hands on the equipment. You can’t take as active a role with the hardware that you used to. (Ron3/2/36)

This statement by Ron shows that for him the transition was a mindset change from doing to managing. This change meant that he had to stop spending time in the lab using the equipment.

Most challenging thing about the transition

The most challenging thing Ron identified during the interviews was Theme 2: Relationship Issues. Please note, however, that when asked to order the challenges he selected Theme 1: Too much going on as the most challenging and Theme 2 as the second most difficult. See the section on research question 3 for quotes.
Summary for Ron

Ron was a Project Engineer with fourteen years in technical contributor roles, and just over six years in a transitional role involving both technical and managerial tasks. He had been a manager for a year and a half at the time of the interviews. He indicated that the peer-subordinate relationship was probably his most challenging aspect of the transition.

Tim

As with the other managers, ‘Too Much Happening’ Tim received this name because he identified too much going on during the transition to keep up with it all as his biggest challenge. This was Theme 1. The discussion that follows presents the responses from Tim relative to research question 1 as well as a view of his biggest challenge.

Managerial job function

Tim’s formal title was Senior Engineer. However, he was acting in a Project Engineer role. He divided his role into three main areas. First was the Project Engineer role:

... make sure that the design effort is progressing the way it should and the build effort is progressing.... reporting status.... keeping everything together.... try to solve any problems that pop up.... manpower, scheduling, and the budgeting … how we’re depleting hours of the budget. I’m involved with doing bids and proposals. Try to promote the prices for new jobs.

Second was as a Leader in a company-wide Quality Initiative (summarized):
Organizing and leading team meetings, delegating tasks and getting input, and conducting the focus group meetings.

Third were his Senior Design Engineer responsibilities:

I’m still responsible for some software development [but this work, for the most part, is not getting done]. (Tim1/1/47)

*Time Percentages*

Tim divided his time into these three areas as shown in Table 10.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering manager</td>
<td>45</td>
</tr>
<tr>
<td>Quality initiative: Team Leader / Management Focus Group Leader</td>
<td>40</td>
</tr>
<tr>
<td>Senior Test Engineer</td>
<td>15</td>
</tr>
</tbody>
</table>


*People reporting to Too Much Happening Tim*

Tim had four engineers reporting to him. He managed the day-to-day assignments and interaction (Tim interview one notes).

*Career Progression*

Tim’s career progression was as follows.

Phase 1: Technical contributor - Twenty years with primary responsibility being technical contribution/design.
Phase 2: Transitional Manager - One year as Senior Engineer doing the Engineering Manager role without formal title (Tim1/5/13-Tim1/7/12 and interview one notes).

Likes and dislikes

Each of the managers was asked about likes and dislikes relative to the engineer role, manager role, and the transition. The following are short quotes or summaries of Tim’s comments regarding each.
Table 11

*Tim’s Likes and Dislikes about Engineer, Manager and the Transition*

<table>
<thead>
<tr>
<th>Manager comment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Liked about being Engineer</strong></td>
</tr>
<tr>
<td>Freedom and independence: job autonomy</td>
</tr>
<tr>
<td>Problem solving: Focus on a problem and solve it</td>
</tr>
<tr>
<td>Focus on a technical issue on your own</td>
</tr>
<tr>
<td><strong>Disliked about being Engineer</strong></td>
</tr>
<tr>
<td>Dealing with management</td>
</tr>
<tr>
<td>Time schedules: asked for input then not taken</td>
</tr>
<tr>
<td>Lack of information needed to do a job/task: working without needed knowledge</td>
</tr>
<tr>
<td><strong>Liked about being a Manager</strong></td>
</tr>
<tr>
<td>Broader perspective: business side of the company</td>
</tr>
<tr>
<td>Better understanding of the financials</td>
</tr>
<tr>
<td>Bringing in business</td>
</tr>
<tr>
<td>Working to make his group profitable and growing</td>
</tr>
<tr>
<td>Prestige</td>
</tr>
<tr>
<td>Feel more valuable to the organization: validation that ‘I’m a contributor’</td>
</tr>
<tr>
<td><strong>Disliked about being a Manager</strong></td>
</tr>
<tr>
<td>Only one identified is more a dislike of the transition</td>
</tr>
<tr>
<td><strong>Liked about the transition</strong></td>
</tr>
<tr>
<td>None identified</td>
</tr>
<tr>
<td><strong>Disliked about transition</strong></td>
</tr>
<tr>
<td>Having 2 major roles: manager and technical</td>
</tr>
<tr>
<td>Not getting any technical work done</td>
</tr>
<tr>
<td>Days and sometimes weeks go by without doing any technical project work.</td>
</tr>
<tr>
<td>Knowing he is hurting his own projects</td>
</tr>
</tbody>
</table>

*Note.* Source: Tim2/5/13 - Tim2/6/54. The statements above are short quotes or summaries of Mark’s comments regarding each aspect.
Comments about the transition

When asked to define the transition, Tim had one word, “difficult” (interview one notes). The next quote shows some additional aspects of the transition. In his case it was a smooth transition to where he was doing little to no technical and mostly managerial work:

That step [into management] is not clearly defined. And it's not! It's hard to describe, hard to define it. Because it's a nebulous type thing. It's a smooth, seamless transition. (Tim1/7/19)

Most challenging thing about the transition

The most challenging thing for Tim was Theme 1: Too much going on: Multiple things to focus on and balance. Tim found it challenging to have high priority management tasks, but at the same time, be responsible for technical work. He was not getting to the technical tasks. See the section on research question 3 for detailed quotes.

Summary for Tim

Tim was a senior engineer acting as a Project Engineer. He had spent twenty years in primarily technical roles. He had been doing almost exclusively managerial work for one year when interviewed. He identified Theme 1, Too Much Going On, as the most challenging aspect of the transition.

Demographics about Participants

The following provides some overview data about the participants. To help ensure their confidentiality, this demographic information is provided without reference to individual managers.
Each of the managers in the study had a technical degree. The degrees and certifications held by a managers in the study were (1) BS Aeronautical/Mechanical Engineering, (2) BS EET, Professional Engineers Certificate, (3) BSEE, MSEE, (4) BSEE, MSEE, and (5) BS Applied Physics. The participants were all very close in age. The career progression details demonstrated how their career’s had been structured. The ages of the managers were (1) 41, (2) 43, (3) 43, (4) 46, and (5) 46. The average age was 43.8.

Cross-Case Discussion

This section presents insights from a comparison of the case summaries. We will look at the managerial job function, career progression, and the likes and dislikes that do not relate to the experiences and themes presented in later sections.

Managerial Job Function

The managerial job functions of the managers showed a fair amount of similarity in titles and duties. Three of the managers had the formal title Project Engineer, while two had the title Program Manager. The Project Engineer title was somewhat misleading. Project Engineer was the title for the first level of manager in the organizations in the study. Others in the organization refer to the Project Engineer as a manager. As Ron said, “I’m what they call a Project Engineer. I’m an engineering manager” (Ron1/1/13). The activities of the Project Engineer also match those of the manager as defined in chapter 1. The following terms were used to describe the daily activities, which all the managers were involved in: coordinating, scheduling, resource allocation, budgeting, administrative, meetings, proposals, and communication. It was interesting to note that
many of managers indicated that the manager role was not what they had expected. Larry stated this clearly:

I don’t think anything’s been the same as what I expected. I mean, it’s constantly different. It’s uh, not a day goes by where I [don’t] say, ‘Man, this is really not what I thought it was going to be like.’ (Larry2/4/34)

The case summaries presented the time percentages each manager used to describe how time was used. The terminology and how they thought about their time use was too diverse to allow for meaningful comparisons. However, two important things did surface: meetings and no technical design work.

The managers indicated that a lot of time was spent in meetings. The following quote shows that meetings are not always formal. They’re around the table sort of meetings:

When I say meetings, they’re not [always] so much formal meetings where we’re always in a room. We may be standing in somebody’s office, but you know it’s a half hour or 45 minutes has gone by. You had a meeting! You had a standup meeting. (Larry1/5/25)

Another commonality was that the managers were not doing technical design. Four of the managers indicated that it was during the transition that they did both engineering and managerial activities. The managerial portion increased until it was 100%. It was often still some time after that before they were given a formal manager title of Program Manager or Project Engineer. For example, Tim had been doing 100% managerial work for a year and still had the formal title of Senior Engineer.
Career Progression

The career progression of the managers was very similar. All of them were in their early to mid 40’s, and had spent many years as an engineer prior to the transition. Most spent multiple years in the transition phase. During the transition phase, four of the five indicated increasing amounts of managerial work leading to exclusively managerial work, even without the title of a manager. Table 12 shows the specifics.

Table 12
Years the Managers were in each Career Phase

<table>
<thead>
<tr>
<th>Phase</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineer</td>
<td>15</td>
<td>17</td>
<td>23</td>
<td>19</td>
<td>14</td>
<td>17.6</td>
</tr>
<tr>
<td>Transition</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>6.5</td>
<td></td>
<td>3.1</td>
</tr>
<tr>
<td>Manager</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1.5</td>
<td></td>
<td>1.5</td>
</tr>
</tbody>
</table>

*Note.* Transition is when the engineer is doing managerial work without the management title.

Likes and dislikes

The likes and dislikes about being an engineer, being a manager and the transition evoked a lot of input from the managers. However, most of the information was discussed by the managers in the context of their experiences with the transition. Table 13 presents just a few of the common likes and dislikes discussed by them. The results of research question 2, showing the experiences and themes, presents this data in a more meaningful and complete way.
Table 13

*Common Likes and Dislikes about Engineer, Manager and the Transition*

<table>
<thead>
<tr>
<th>Manager Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Liked about being Engineer</strong></td>
</tr>
<tr>
<td>Creating something, hands on, ownership</td>
</tr>
<tr>
<td>Problem solving</td>
</tr>
<tr>
<td>Focus on technical issue</td>
</tr>
<tr>
<td><strong>Disliked about being Engineer</strong></td>
</tr>
<tr>
<td>Others set schedule and tell you what to do</td>
</tr>
<tr>
<td>Status reports</td>
</tr>
<tr>
<td>Wanted to see the bigger picture, be more involved</td>
</tr>
<tr>
<td><strong>Liked about being a Manager</strong></td>
</tr>
<tr>
<td>Learning more of the business side, broader knowledge</td>
</tr>
<tr>
<td>Interacting with customers and management</td>
</tr>
<tr>
<td><strong>Disliked about being a Manager</strong></td>
</tr>
<tr>
<td>See section on challenges</td>
</tr>
<tr>
<td><strong>Liked about the transition</strong></td>
</tr>
<tr>
<td>See likes about being a manager</td>
</tr>
<tr>
<td><strong>Disliked about transition</strong></td>
</tr>
<tr>
<td>Thrown into it: school of hard knocks</td>
</tr>
<tr>
<td>Relationship change with engineers</td>
</tr>
<tr>
<td>See section on challenges</td>
</tr>
</tbody>
</table>

*Comments about the transition and challenges*

One common pattern was that the managers indicated that the transition was difficult. This supported the presupposition underlying the research—that it was a
difficult transition. The section on the challenges covers manager comments about what was difficult. The next section discusses the data related to research question 2.

Research Question 2

*What are common experiences for engineers who transition to engineering manager?*

The following discussion identifies common experiences that the engineering managers in the study had during their transitions. The term experience refers to an incident, condition, or feeling the participant had during the transition to manager, which they described during the interviews. The experiences were generally things that happened and were memorable to them. The managers discussed them during the interviews because they felt they were worth mentioning. Each individual experience below indicates how many of the managers identified this experience. It is important to note that other managers who are not listed as having mentioned a given experience may have had the same experience but did not think it worth mentioning or it did not occur to them during the interviews. See Appendix B for a complete listing of the experiences.

The experiences discussed below were grouped into nine themes. These themes combine related experiences. The following is a list of the themes:

Theme 1 – So much going on: The engineering manager role involves balancing many more responsibilities, tasks and priorities than the engineering role

Theme 2 – Relationship changes: Personal relationships, interaction dynamics and engineer perceptions of you have changed
Theme 3 – Delegation: The challenge of leaving the hands on technical behind and learning to work through others

Theme 4 – Increased stress and pressure associated with increased responsibility

Theme 5 – Developing new skills: Discovered the need for a new set of skills as a manager

Theme 6 – Resources and getting the work done: Finding the time, the staff and other resources to get it done

Theme 7 – The new guy in management: change from being a technical expert to being new in management and having a lot to learn

Theme 8– Organizational issues: In a new organizational level with its associated issues

Theme 9 – Choosing the management career path: the concerns before deciding and questions experienced during or after the transition

Theses themes are numbered according to the difficulty ranking they received from the managers. Each theme and experience will now be discussed. A summary is provided for each item, along with pertinent quotes from participants.

Theme 1

So much going on: The engineering manager role involves balancing many more responsibilities, tasks and priorities than the engineering role.

This theme highlights a difference in the nature of the engineering manager job from what the engineer does. As an engineer, the participant generally had a very clear focus: to complete one or more technical tasks or components. Of course there were other
things they needed to do, but for the most part they were focused on solving a technical issue. As an engineering manager they moved into a role where many things needed their attention. They had to balance multiple competing demands and make quick decisions about when to stop working on one thing and focus on a new issue, which had just popped up. These two roles also had very different daily duties associated with them. This change from primarily a single, clear focused role, to a dynamic, multi-focused role was something challenging for the participants. This theme has six experiences, which are related yet distinct aspects of the transition.

The experiences are:

Experience 1.1: Change from a primarily single focus engineer role to a broader, multiple focus managerial role

Experience 1.2: Required to balance and prioritize many tasks and roles

Experience 1.3: Interruptions frequently occur and require you to drop what you are doing and respond immediately

Experience 1.4: Meetings demand much of your time

Experience 1.5: Difficult to maintain two distinct roles during transition: Working as an engineer and as a manager

Experience 1.6: Am I doing the job right? Proving your worth and staying ‘on top of things’ when the unexpected occurs

Each experience will now be examined.
Experience 1.1

*Change from a primarily single focus engineer role to a broader, multiple focus managerial role. 5/5*

This experience represents a big adjustment for the participants. The change from being primarily single focused as an engineer to the manager role, with so many areas to focus on, was challenging for all of the participants.

*Don*

The following quote identifies how the new manager role kept Don constantly moving to new things. He could no longer see a specific task through to completion:

[Disliked about being a manager] not being able to focus or see one thing through to its completion. (Don2/8/15)

Concerned about the many things that are going on at the same time.... like a moving target … keeping everything coordinated such that things don’t crash. (Don2/8/1)

*Mark*

The following quotes from Mark show that he was multiplexing many things. He found this aspect of managing very difficult. He felt like he had to please everyone—managers, the customer, and the engineers:

Multiplexing of all the activities that are going on.... you just try and get bits and pieces of it all and you don’t want it to fall apart. (Mark3/10/14)

It’s much more difficult being a manager than it ever was being a technical person. And I’ll tell you the reasons. The reasons are that when you’re
technical, you worry about the technical issues and you’re trying to maintain you’re technical expertise. When you’re a manager, you’re worrying about the technical people but you’re also now worrying about the financial people. You’re also worrying about the customer. And you’re also worrying about your upper management. And typically being there, the feeling is that you’re being torn between many different people. And you’re constantly making judgments as to whether or not you’re doing the right thing.... So basically you’re working for everybody. And you’ve got to satisfy kind of everybody.

(Mark 2/6/3)

Lot of different tasks on your plate. (Mark 4/5/35)

_Larry_

A lot of tugs and pulls in different directions.... I guess that part is not what I thought it would be like. I thought it would be a lot calmer. (Larry 2/5/13)

_Ron_

Engineer: single task focus ... Engineering manager: Broader focus (Ron interview two notes)

_Tim_

When you’re working on one thing as an engineer, you know what you’re problems are and go. But when you’re managing there are so many different disciplines that you’re managing the probability of having a fire has increased.
Because now there’s 4 people working on the job and any one of those 4 can have a problem that they need you for. (Tim3/2/41)

I have multiple projects that I’m managing. And it’s difficult to stay focused because there’s always a problem. There’s always a hot problem on one of the projects. (Tim3/2/16)

Comment

Experiences 1.1, 1.2 and 1.3 are very closely related. The multiple focus areas of the manager role lead to the need to balance and prioritize them. The frequent interruptions are also a result of the many areas requiring the manager’s attention. These interruptions must be evaluated and prioritized compared to the other tasks to maintain the balance the managers speak of.

Experience 1.2

Required to balance and prioritize many tasks and roles. 3/5

As an engineering manager the participants found it challenging to balance their various responsibilities. If too much time was spent on one area, other things would suffer. Time management, prioritizing and finding a way to keep everything going became very important.

Mark

Balance is a very, very important aspect of this whole thing. To be able to balance all of these different inputs and balance the control of the organization. (Mark 2/6/19)
How much time should I spend in this area, with that and learning that? If I spend too much something else is gonna fall apart over here. So you’re always, there’s a little time in averaging and multiplexing of all the activities that are going on. Always multiplexing … you just try and get bits and pieces of it all and you don’t want it to fall apart. (Mark3/10/14)

Discussing the fact that you can’t do it all, Mark points out that he was not able to do it all. He had to focus on the most important things and the others did not get done:

You have a lot of different tasks on your plate, it’s almost like the guy spinning the plates and juggling apples at the same time. There are things that are gonna fall. Or possibly fall if you don’t multiplex fast enough, your loop time in averaging does not increase to a point where you can keep everything up at the same time. (Mark4/5/34)

Larry

In the following quote, and those by Tim below, the analogy of juggling was used by the managers to convey how they viewed the manager role:

You got five balls in the air at one time, juggling everything, just trying to keep them all up there. And every once in a while you will drop one. (Larry2/5/13)

Tim

A web of things I’m finding difficult to control. And that is I guess the difficulty is controlling my time. Utilizing my time efficiently. (Tim3/4/35)
Juggling the different priorities and doing the prioritization. And prioritizing myself and how I service each problem is difficult. (Tim3/2/25)

I have multiple projects that I’m managing.... if I don’t service everyone, everyone will stand still. (Tim3/2/16)

**Experience 1.3**

*Interruptions frequently occur and require you to drop what you are doing and respond immediately.* 3/5

For some of the participants, interruptions stood out very clearly as something to discuss relative to the transition from engineer to manager. The nature of the job, with its many responsibilities and many people to be responsible for, made interruptions nearly unavoidable. A high priority task was being worked on when a new issue came up and interrupted the current task and drew them away to solve it. Then something interrupted that and so on.

*Mark*

Some things are more immediate needs and you have to set aside what you’re doing and typically things will take a lot longer or you’ll have to learn to manage many things simultaneously. (Mark3/3/17)

*Larry*

You’re in the middle of working a proposal, you’re in the middle of working a customer query, a customer response, and all of a sudden the phone rings and...
it’s a guy from headquarters and he, wants to know the answer immediately, so you know, drop everything, ok, let’s respond to this. (Larry1/3/31)

Something pops up that you have to change horses and tend to real quick … take care of all these ‘fire drills’ that pop up, ok?… scurrying around fighting fire drills, trying to put them out as they pop up. (Larry2/4/37)

Tim

The squeaky wheel gets the oil. And when there are problems that other people have they come to me. So I have to address these issues. (Tim1/2/7)

I have multiple projects that I’m managing. And it’s difficult to stay focused because there’s always a problem.... But before that problem is resolved, there’s another problem that pops up on the other project. (Tim3/2/16)

In the following quote, Tim compares the manager role to being a fireman. In a quote above, Larry makes the same comparison:

Sometimes just becomes a fireman’s effort. You know, which fire is bigger and which fire needs to be put out. (Tim3/2/37)

Experience 1.4

Meetings demand much of your time. 3/5

This experience highlights meetings as a source of change for the engineering manager. As engineering managers they were spending a lot of time in meetings. Meetings were often the way they did the work of managing. This was a real change from
being an engineer. As engineers, meetings were often viewed as something that got in the way of doing work. Now the meeting was the work.

_Larry_

A lotta meetings. A lotta. More meetings than I care to go to. (Larry1/3/19)

In response to the interview guide 3 question 4, which is about what a friend or confidante would say was the most difficult thing about the manager’s transition, Larry provided the following answer:

‘How do you sit there for, could be 2 or 3 hours at a time, and listen to this Bull? Don’t you want to just get up and just yell at these guys?’ And I say, ‘Well, yeah! You do! But, you know, you gotta do it in a more constructive way. You gotta just, you know, uh get your point across.... he knows I, get a little uh frustrated or antsy sometimes, you know, where I want to get to a resolution, Ok? And this can drag—some of these meetings can drag on for two or three [hours]—all day sometimes! … and sometimes you walk away without a resolution!… that’s the toughest part that he’s seen me go through.

(Larry3/10/4)

_Ron_

Generally my day is pretty much 60% in meetings, 60-70% in meetings.

(Ron1/4/10)
Tim

In the following two quotes, Tim shows the view engineers had about meetings as ‘a necessary evil’ or ‘big waste of time’:

As an engineer, if I had a meeting it was something I needed to attend, it was a status meeting, ok, those are always killers but it’s a necessary evil.

(Tim3/2/50)

As an engineer, meetings were something you go to because you had to go to it … status meetings are the big waste of time. (Tim3/3/17)

As a manager the meetings had taken on a vital role:

[As a manager] I’m finding that most of my day is consumed in meetings. And uh, when you’re in a meeting you’re not really getting much work done.

(Tim3/2/51)

The following quote is interesting because it shows the transformation that was occurring in Tim’s attitude about meetings:

I’m a culprit because I call a lot of [meetings]…. I guess that’s what managing is about. It’s collecting information, processing information on a project as opposed to the little piece of the pie I used to have [as an engineer]. Now I have the whole pie. So I need to keep everything together so I spend a lot of time in meetings that I call or meetings that someone else calls. Or technical type of things that I’m staffed to sit in on. (Tim3/2/49)
This statement by Tim pointed out that during a meeting, not only was he unable to do certain things he wanted to do, but he also was given additional items that needed to be handled immediately:

I participate in the meeting and I may even have some very good input in the meeting, um, but I am sitting there thinking about other things. About how, yea, ok, when I get out of here, first thing I’m gonna do is this. And then I’ve got to talk to him about this and make sure this is going right. But a result might be, hey [Tim], if you’re in this meeting, hey, you know what we need you to do? Boom, we need you to do this right after the meeting. So it’s like, ok, not only did the meeting stop me from doing that but the action I got from the meeting stopped me from doing that. (Tim3/4/29)

As with Larry, Tim identified attending meetings, as the thing those close to him would say was the most challenging thing about his transition:

Meetings. They would say that I spent, they would say that I complain about spending all day in meetings and not getting work done. I guarantee that. That would be the major thing. (Tim3/8/36)

Experience 1.5

Difficult to maintain two distinct roles during transition: working as an engineer and as a manager. 2/5

This experience reflected the challenge of trying to do two roles simultaneously. The manager role was higher priority and required more time than was available. The result was that the engineer role didn’t get done. This transition overlap corresponded to
the period when the participant was doing the manager role but also responsible for some technical work.

Ron

And the second [most challenging thing about the transition] was working and managing. (Ron3/6/8)

That’s the transition. And it’s, realization that—I don’t know if I’ve said this before. It might sound funny—but you can’t work and manage at the same time. You have to either work or you have to manage.... You just don’t have that, the luxury of that kind of time to do everything. (Ron3/2/35)

Tim

I’m still in that transitional phase. So what I’m not liking is that fact I’m still maintaining two responsibilities. I still have the two hats going. And I don’t have time to handle the two hats. I don’t have time to be the engineering manager and the engineer. So that’s what I’m not liking. The fact that days and sometimes weeks go by, um, and I don’t even get to do any project work. And being a manager I know I’m falling behind my own schedule. So it’s kind of like killing myself. I’m not even getting my own work done and I have to yell at myself for not getting the work done and yet I know I need to focus on other things. (Tim2/5/54)

[The most difficult thing is] definitely related to my time. And the most difficult thing, as this transition goes on … [is that] I’m still responsible for technical work [ but I’m not getting to it, it’s not getting done]. (Tim3/4/48)
Experience 1.6

*Am I doing the job right? Proving your worth and staying ‘on top of things’ when the unexpected occurs.* 2/5

The engineering job had identifiable deliverables and it was fairly easy for the engineers to identify their contribution. As an engineering manager, the nature of the job made it difficult to identify when they were doing well. There were times when participants thought things were going well, and something unexpected would come along and all of a sudden there were big problems and they were scrambling to get back on top of things. The multi-faceted nature of the job made it difficult to identify or measure when the job was being done successfully.

*Mark*

[Thought] everything was rosy but that came out of the blue and just whacked you on the head. (Mark3/6/6)

*Larry*

The following statement by Larry shows that he felt a need to prove his worth as a manager, more than he did as an engineer:

When you get more into the managerial area that you sense that, uh, you always have to be almost proving your worth. You know, you’re not producing a product anymore, you’re not producing a program, so you have to somehow get the point across to your boss that ‘I’m doing the job right, and I’m doing it well and I’m on top of things.’ (Larry3/1/51)
Summary of Theme 1

As the participant statements examined show, the transition to engineering manager resulted in a change in the nature of the job. The manager role was much more dynamic and multi-faceted. This area of the transition was identified by the participants as one of the more challenging aspects of the transition.

Theme 2

Relationship changes: Personal relationships, interaction dynamics and engineer perceptions of you have changed.

This theme represents the experience of the engineering managers regarding their relationship with the engineers. As an engineer they were part of a group with other engineers. When promoted, they were managing the group composed previously of their peers. The dynamics of this relationship introduced a variety of experiences. Within this category are ten different experiences that surfaced during the interviews. Each experience has its own distinct aspect. The relationship category was one the engineering managers found challenging. The experiences included in this category are:

Experience 2.1: On a different organizational level: no longer “one of the guys”, instead perceived as ‘one of them’, the enemy

Experience 2.2: Resentment or jealousy by some engineers that you were promoted instead of them

Experience 2.3: Engineers trying to take advantage of friendship with you

Experience 2.4: It is tough to discipline former peer / engineer

Experience 2.5: Need to be careful about what you say to the engineers
Experience 2.6: Getting the respect you feel you need to do your job

Experience 2.7: It is difficult to lay off engineers who you know personally

Experience 2.8: Evaluating your former peers: knowing the potential impact on their career

Experience 2.9: The relationship side of delegation: occasionally need to assign mundane or ‘dog work’ to prior peer

Experience 2.10: Losing trust and credibility: letting people down who rely on you for technical work

Each of these experiences will now be examined.

Experience 2.1

On a different organizational level: no longer ‘one of the guys’, instead perceived as ‘one of them’, the enemy. 5/5

As engineers, the participants worked together with and had camaraderie with the other engineers. When the participants made the transition into management they were no longer part of this group. The participants discovered that in their new role as an engineering manager the engineers trusted them less. In some cases, they even felt like they were perceived as the enemy. The quotes below demonstrate their thoughts about this experience.

Don

A change in the social aspect whereas before when we were all engineers and you all worked for one person, say um, you were all equal … [after the
transition] I wasn’t always an equal … and sometimes I was, I was considered the enemy. (Don 3/2/32)

Mark

Mark points out one reason he believed the engineers had less trust and how that caused them to trust less:

Once you get into management and people start seeing you in meetings with managers or directors or others in higher authority, they back off just a little bit. (Mark 2/1/43)

[Engineers] perceive you differently when you’ve made your transition to a manager … [they] do not want to open up as much. There was less trust in me [as a manager] than when I was working with them [as an engineer]. (Mark 2/1/43)

Larry

You can’t go and say ‘Hey, I’m one of you guys!’ because you’re not! (Larry 2/3/54)

The following statement by Larry highlights another aspect of the perception of the engineers and how that changed their interactions with the new manager:

Did I become one of ‘Them’?… There’s that perception I guess that when you change to management all of a sudden your whole outlook and thought process changes…. the guys you worked with for ten, fifteen, twenty years or whatever all of a sudden perceive you as the enemy. (Larry 2/1/12)
It appeared that the term ‘enemy’ was related to the following quote. Larry summarized the way the engineers seemed to act when he came around:

   Be Careful! Y’know, ‘Don’t do something wrong around [Larry] or else a little black check is going to go next to my name.’ (Larry2/2/14)

Related to the perception of change, Larry had the experience of putting up with jokes. This quote shows how significant the switch from engineer to manager was and how the engineers really didn’t think the manager was one of them:

   The overall relationship with my [previous peers], it’s a difficult one.... Comments will be made, mostly in jest but a lotta times there’s some truth in those statements. You know, comments like ‘Is the lobotomy finished now?’ … Those typical jokes where, you know-the put-downs. (Larry2/3/36)

The change in the relationship resulted in the following personal feelings:

   Now managing people you used to work with. That’s an awkward situation. (Larry2/1/45)

Ron

The transition from … engineers being your peer to now being your subordinate … you were on their level previous, now they’re reporting to you. (Ron3/1/18)

The peer-subordinate [relationship] was probably the most challenging. (Ron3/6/8)
Tim

Relationships I had with people prior to any inkling of my getting down the management path … have changed.... I heard a comment less than two weeks ago, [from an] individual whom I’ve been working with the past 3 or 4 years.... [she] said, ‘well, [Tim’s] turned to the dark side now.’ … There’s less trust there. (Tim2/3/47)

This experience was related to Experience 2.5. The engineers were less open in their conversations with the new managers because of the lack of trust. In addition, the new managers had to be less open about certain things they knew: they now had access to more information; some could not be shared.

Experience 2.2

Resentment or jealousy by some engineers that you were promoted instead of them. 3/5

In the interactions with the engineers, some demonstrated jealousy and/or resentment when the participant was promoted. The following quotes demonstrate this experience.

Don

A little bit of resentment I would think from people saying, well, [Don] is in charge. How come he’s in charge, you know? I could be in charge, you know. (Don2/5/8)
Mark

The only thing is how come [Mark’s] there and I’m not? (Mark4/1/36)

Tim

And then there’s another relationship change and that is the jealousy nature.... They are resentful … why is this guy the one to get picked to do this and not me? (Tim2/4/2)

Experience 2.3

Engineers trying to take advantage of friendship with you. 2/5

Some of the managers identified the experience of having individuals try to take advantage of past friendships. These were people they had been friends with as engineers or engineers who tried to become their friends now that they were managers. The friend tried to use this relationship to get information or other advantages from the manager because of the friendship.

Mark

Your friend … where you’re a manager, um, they tend to take advantage. And when that happens you gotta kind of cut them back off. (Mark2/2/39)

Larry

They’re constantly pumping you for information because ‘you used to be my friend. Hey, you were my friend at one time.’ You know. That type of an attitude. (Larry2/3/54)
Experience 2.4

*It is tough to discipline former peer / engineer. 2/5*

Some of the managers discussed the issue of disciplining an engineer, someone they formerly were peers with. They found this tough even though they knew it was necessary.

*Ron*

In this comment, Ron identifies the challenge he faced when an engineer who reported to him was way out of line and discipline was required:

They’ve pushed me to the limit, or they’ve acted inappropriately to the point where it’s absolutely warranted.... You’re really forced into doing it and doing it now before it goes any further. (Ron3/2/17)

When you need to invoke a little bit of discipline. That’s kind of tough to do sometimes. (Ron3/1/49)

*Tim*

I never felt comfortable instilling discipline on [engineers]. (Tim3/7/33)

Experience 2.5

*Need to be careful about what you say to the engineers. 2/5*

The participants indicated the need to be careful with certain information or opinions. As a manager they had to be careful when talking about individuals. In addition, they had access to important information about what the organization was planning. This information could not be shared before it was time.
Mark

[Being careful what you say about people] you talk with one individual about somebody else, that individual is gonna wonder if you talk about them in the same way. And word gets around very quickly. (Mark 4/7/16)

Larry

You gotta be careful what you say, because you’re privy now to information you were not privy to before.... be careful how you use that information.

(Larry 2/1/36)

Experience 2.6

*Getting the respect you feel you need to do your job.* 2/5

The participants felt the need to prove themselves to the engineers who previously were peers. This was important since they felt they could not effectively manage the engineers without respect.

Don

I guess right away when I became put in charge I thought, you know, right away I would get the respect of my peers and they would want to do a good job for me right off the bat. And that was a, I don’t know where I got that impression from. That was definitely not the case. (Don 2/5/8)

Ron

Worried about … are you going to get the respect that you deserve, you know, and the respect you need.... proving yourself. (Ron 3/1/29)
**Experience 2.7**

*It is difficult to lay off engineers who you know personally. 1/5*

One the surface, this layoff experience seemed to be an organizational issue. However, the thing that was difficult, and made this experience stand out for the participant, was the relationship with the engineer(s)—the knowledge of the impact the layoff would have on a personal level for that engineer.

**Larry**

[The most difficult thing] without a doubt, it was my first lay-off. Having to go through my first layoff.... you’re looking at these names and you’re trying to weigh one name against another name, saying ‘He should go’ of ‘He should stay.’ And it’s very difficult. (Larry3/3/44)

It’s difficult because you know these guys personally.... when you know, the guy, and you’ve met his family, and you’ve met the kids [and they know your kids and ] they were playing sports together or whatever, it’s difficult. It’s very difficult. (Larry3/4/7)

I mean, y’know, you’re making a decision that’s obviously impacting their life. Not just impacting their job when they come in here the next day. Like you know, you’re assigning a guy to a job that he may not like? Hey, that’s easy! You’re making a decision where this guy’s gotta change his whole life. And start looking for another job, maybe relocate because he can’t find a job. So, it’s, it’s a big decision. It’s not easy. (Larry3/5/4)
Experience 2.8

_Evaluating your former peers: knowing the potential impact on their career. 1/5_

This experience reflects a manager’s dislike for doing performance reviews on former peers. He knew the possible impact it could have on their job and career.

_Larry_

The following two quotes show Larry’s dislike of the performance evaluations:

Employee evaluations. Don’t like them. Again, I’ve know these guys on a co-worker relationship for a number of years. I know all these guys. Now you’re put into a situation where you have to evaluate them on a job performance level. Not only do you have to write down words to that effect, you have to document it. Ok. So we have an online system where you have to go in twice a year. It’s a um, semi-interim report and a final report. (Larry2/7/34)

In the back of your mind you know that ‘what I write here could come back to haunt this individual, next layoff.’ Ok? Or next raise.... Because whatever you type in there is going to be held against that person. You know? At least in the short term. Probably in the long term, y’know, it’ll all get filtered out or whatever. But in the short term it could affect raises, promotions, layoffs.

(Larry3/8/4)

Experience 2.9

_The relationship side of delegation: occasionally need to assign mundane or ‘dog work’ to prior peer. 1/5_
The engineering manager found that assigning tasks, especially mundane assignments, to engineers who were previously peers was a bit difficult at first.

*Tim*

[As an engineer] it was, hey can you help me out with something. Then they’d sit down and we’d work through something. But now [as a manager] I’m delegating a role. Listen I need you to do this really mundane work. You know. That’s another difficulty that I’m getting through part of that switchover. People that looked at me as a peer, now they’re getting work from me that they’d rather not do. So I get that little bit of resistance there I guess.

(Tim3/1/47)

It’s kind of like, oh sure [now that you’re a manager] you’re gonna give me all the dog work.... I get that feeling. (Tim3/2/10)

*Experience 2.10*

*Losing trust and credibility: letting people down who rely on you for technical work.* 1/5

As an engineer this participant took pride in solving technical problems and helping others. In the transition, the participant was overloaded with managerial work and not getting to some of the remaining technical tasks. There was a feeling of letting people down and losing credibility as a technical person.
Tim

All the technical stuff I’m letting go. And that’s eroding my … credibility … Whereas I used to be a guy where if you had a problem, I’d jump down there and I’d just sit down there for 3 days until I figured it out. Now I’m the guy who I always cursed [because I don’t get the technical things done that others are relying on me to do]. (Tim3/5/46)

Summary of Theme 2

The experiences just discussed demonstrated the challenging nature of the relationship changes for the participants. The experiences identified occurred as the participants transitioned from being engineers to engineering managers. The participants identified the relationship changes as one of the more challenging aspects of the transition.

Theme 3

Delegation: the challenge of leaving the hands on technical behind and learning to work through others. 5/5

This theme identifies the experiences related to delegation and getting things done through other people. As an engineer, the participants were responsible for doing technical design work. Now in the manager role, they no longer did the hands-on technical work; instead, they were responsible for an entire product or multiple products but others did the actual engineering work. This change had various aspects to it. The engineering managers had to learn how to delegate effectively. They also had to stop doing the technical work. For many of the managers this was not easy. They enjoyed the
technical work, but realized that to move into management they must stop doing the hands on work. Within this theme are four experience items reflecting different aspects of this part of the transition from engineer to manager. The experiences are:

Experience 3.1: Working through others: a mindset change from ‘doing’ to ‘managing’

Experience 3.2: Enjoyed the technical work and miss the satisfaction of doing the hands-on work

Experience 3.3: Letting engineers do their own design: Overcoming the feeling that ‘my way is better’ or ‘I’d get it done faster’

Experience 3.4: Wanted to control everything, but learned that you can’t

Each experience will now be examined.

*Experience 3.1*

*Working through others: a mindset change from ‘doing’ to ‘managing’. 5/5*

This experience shows the difficulty experienced by the participants in working through others, and trusting others to do the work. As engineering managers they were responsible to see that the job was done right, but the engineers were actually doing the design work. Many of the participants mentioned a change in mindset, a realization that came to them that they had to let the technical go. They had to make a conscious decision to step back from the technical and focus on managing. Some even identify that realization, and change of mindset, as a key point in the transition from engineer to manager. The participants found this experience difficult.
Don

Don really struggled with this aspect of the transition, as the following quote clearly demonstrates:

The single most difficult thing was just the frustration I felt in trying to get things accomplished that I couldn’t personally do. I found that to be the one single biggest thing that I had trouble with.... [as an engineer] I could do it myself. If I was running into problems like take the example I just gave you where I was running 2 weeks late and I knew I only had a week to do it, well I would call my wife, tell her I won’t be home for a couple of days. I’d work you know, all night. Or whatever had to get done and I would do it.... now [as an engineering manager] I couldn’t do that anymore. No matter how hard I worked or how much overtime I put in, it wasn’t being applied to the tasks at hand that needed to be done because they were other people’s responsibility.

(Don3/3/13)

This quote shows how Don struggled with trying to accomplish things that he relied on others to do:

[As an engineer] you’re basically relying on yourself. You’re schoolwork, you have books where you look things up. You work things out analytically or in a notebook, you take notes. It’s a very almost self-centered activity. [the technical design] is basically your baby, your thing. When you’re working with other people, it’s a very [extroverted] activity where now you’re working with people. You’re working through people to try and understand where they are in
their design process.... Trying to get them to commit to dates and meet their commitments, it’s very different. (Don2/1/17)

Well the big step I guess was from being an individual engineer and responsible for just your work to going to being someone who is responsible for the work of other people. That was a big change for me and it was more of a mindset change.... now I had to work through other people to get things done.

That was very hard to take at first. (Don1/7/8)

This quote and the next one show the difficulty Don had in changing his mindset from doing the work himself, to working through someone else.

The [xyz] job was the first project that I didn’t do any design myself. That I strictly ran the job. So if I had to pick a turning point or something, that was it. And for that job it was 100% trying to get things done through others and I had a very hard time in doing that.... spent endless days just checking on people coming home exhausted and being very upset that it didn’t feel like I had anything, I didn’t get anything accomplished. (Don1/7/27)

Mark

You learn to delegate a little bit more to people down the line from you.

(Mark4/5/42)

Realize that you have to let the technical go and move into the management role. You want to become a good manager and to do it you must let the technical go. (Mark2/5/35)
Larry

You’re still thinking like you want to do the job, but you can’t really do the job. You now have to delegate and try to manage and coordinate, and control it from a different aspect, and that’s, that sometimes is a big transition. (Larry2/1/25)

Ron

Responsible for their work – Not doing the work but having others do it but being responsible for it. (Ron interview two notes)

 Learned to depend on others. (Ron3/4/13)

One of the things you have to learn is how to stop … working. And start managing…. that is something that doesn’t necessarily happen naturally.... you have to learn how to delegate! And it’s something that doesn’t come natural.... [as] an engineer, you’re Hands On.... at some point you come to the realization that … You can’t work and manage at the same time. Or else you’re not going to be manager. (Ron1/9/57)

When asked to define the transition from engineer to manager, Ron responded:

It’s not a clear moment in time, but (long pause) … when you realize that you just have to start delegating I guess. (Ron1/10/30)

Tim

Delegating work is a personal thing that I’ve never really done before.... I know I’m capable of doing all 3 of those things. But I’m now, now I’m giving
it away to someone else. And um, I know I’ve said before it’s a matter of developing trust in the person you’re delegating to. And you need blind trust. Because I cannot afford to review in detail the results of that assignment.

(Tim3/6/13)

Am I burning myself by trusting them? But I consciously say to myself, yea, I have no choice. They have to do it. It’s got to get done. (Tim3/6/28)

**Experience 3.2**

*Enjoyed the technical work and miss the satisfaction of doing the hands-on work.*

5/5

This experience highlights the fact that the engineering managers missed the technical work. They wanted to get into the technical work but knew that they couldn’t.

**Don**

[First project he had no design/engineer work] it didn’t feel like I was a contributor anymore. And that upset me. (Don1/7/27)

In the following quotes, we see that Don missed the satisfaction of the engineering work:

You don’t get the same sense of satisfaction that you do actually doing it yourself, working with your own hands and creating it. (Don2/6/2)

I didn’t feel like I was doing anything that I was personally responsible for. Um, I didn’t get the satisfaction from working with my hands say, you know,
actually building it and saying that I did this. I missed that satisfaction of you
know, creating something by yourself. (Don3/2/20)

Mark

I dislike not being able to dabble in the technical arena as much as I was
before. (Mark3/3/1)

Like the hands on experience that goes along with being an engineer … being
able to see the actual result of those changes that I had made, and being
instrumental in achieving a goal that way…. the primary satisfaction [I] got out
of being an engineer was the actual designing of that project and seeing that
project being successful. (Mark3/1/6)

Larry

You want to sometimes do the job yourself but you can’t any longer.
(Larry2/2/30)

In some respects I think I made the wrong decision [coming into management].
I should’ve just stayed where I was, Um. As much as I hate to admit it, my
wife always says I’m a, a Nerd at heart. You know. You just like to tinker and
play and do that kind of stuff. And I can’t do that any more. (Larry2/10/35)

Ron

You can’t take as active a role with the hardware [as] you used to. (Ron3/2/36)

Your instinct is to go back [to the technical]. (Ron3/3/5)
**Tim**

It’s just, I love software. It just makes so much sense to me. Such a logical flow of information. So yea, there are times when I miss, I’d love to just sit down for a whole day and just start writing code again. (Tim2/3/15)

**Experience 3.3**

*Letting engineers do their own design: Overcoming the feeling that ‘my way is better’ or ‘I’d get it done faster’. 4/5*

One challenging aspect of delegation was that the managers came from the engineering ranks; therefore, they could do the work their engineers were doing. Many of them felt that if they could just jump in and do the work instead of delegating it they could get it done faster and/or better. Their tendency was to get into the design details. In addition, they indicated that initially they wanted to dictate to the engineer how to do the design. However, they learned that they couldn’t do that. The engineering manager had to delegate the technical details and focus on the many other things that were their responsibility.

**Don**

Directing people to do the design just the way you want it, it doesn’t work.

(Don2/4/27)

The [engineers] who are working for you have their own way of implementing things and not specifically, they don’t share the same vision that you had … yes it’s my job but it’s not exactly the way I, it didn’t come out exactly the way I would have done it, that kind of stuff. (Don2/6/2)
The strength in an engineering manager being to delegate. You are delegating tasks. You know what has to get done and then you decide who does it. My problem was when you delegate something, I still wanted it done my way. That I had a particular idea in my head of how a task would be handled and that would be how I would handle it and I’ve now since learned that part of delegating and all is allowing the person who’s doing the task to do it their way. And I didn’t realize that then. (Don1/9/37)

Mark

Not get down into the finite details of the project all the time and micro manage it. It’s difficult to step back when you can see something that’s being done maybe not the way that you would have done it. Maybe you would have done it better. But you have to let people learn … You just have to let them learn on their own a little bit. (Mark4/2/50)

Larry

If I could only do this job myself I’d get it done faster.’ But you can’t. (Larry2/1/25)

Tim

[Resistance to giving work to someone else which he would like to be doing so that he knows it is done right] … I’m consciously trying to push that quality trait away. Constantly just saying let it go. You know, just give it up. (Tim3/6/38)
Experience 3.4

Wanted to control everything, but learned that you can’t. 2/5

This experience shows that some of the participants wanted to control everything at the manager level, the same way they had controlled their own designs. They discovered that it was not realistic and had to let go of the desire to control everything.

Don

I realize that these are not things under my control and just to do the best that I can in meeting them. (Don2/7/50)

Mark

I tried to control everything. I tried to control contracts. I tried to control engineering law. (Mark2/7/12)

Summary of Theme 3

The four experiences just discussed show that the participants found delegating a challenge. They transitioned from the engineering role, where they did the hands-on design work, to the engineering manager role, where they had to work through others to get everything done. This mindset change involved leaving behind the technical work, which had been a key part of their job prior to the transition. This change was identified by the participants as one of the more challenging things about the transition.
Theme 4

*Increased stress and pressure associated with increased responsibility. 5/5*

The pressure and stress theme ties into most of the other themes. However, specific comments were made relative to pressure and stress as two aspects of the manager job. Those aspects were increased responsibility and working within resource limitations such as timeframes, budgets, etc. All of the participants commented on this category in some way. The experiences in this theme are:

Experience 4.1: Increased responsibility: ownership of something much larger and impact of decisions increased

Experience 4.2: More pressure and stress

Now each of these experiences is examined.

Experience 4.1

*Increased responsibility: ownership of something much larger and impact of decisions increased. 5/5*

This experience reflects the increased responsibility of a manager and the impact it had on the participant. This responsibility resulted in stress or pressure, perhaps two words used to convey similar meanings.

Don

More responsibility. (Don2/5/15)

Definitely more stressed. (Don3/2/44)
Mark

[As] an engineer [I] was maybe making decisions that were maybe ten $100 decisions a day.... [as an engineering] manager [I am] making $3000 decisions a day or sometimes it could be millions. So your decisions directly, my decisions directly impacted all the rest of the organization. (Mark4/6/31)

Ron

The added responsibility that you feel, like the personal ownership to a much bigger thing that’s larger than , than what you had been responsible for, you know? I’ve always felt personally responsible for my output, but now I’m responsible for something that’s larger than I had been so I think the pressure—there’s more pressure. (Ron3/6/40)

Larry

While discussing things that are much different than he expected, Larry specifically identified “the pressure … [and] the stress” (Larry2/4/35).

Tim

An increase in stress because you know now there are … 5 people working for you, you have 5 times the problems. (Tim2/4/44)
Experience 4.2

More pressure and stress. 4/5

Another experience of the participants was the need to meet deadlines, milestones, budgets and the like. These deadlines resulted in stress due to pressure from the company and/or from the customer.

Don

I would come home all stressed out by that because I knew a lot of things had to get done. (Don3/2/45)

Mark

Try to hit [the budget] right on the nose. If you go over your budget, the customers mad at you. And the companies mad at you for going over if the customers mad at you. But then the company makes more money. If you go under budget, which I did the first time being in that role. And I saved the company, I thought $250,000 but in a cost plus environment they were looking at that $250,000 in sales.... you could be the bad guy for going over budget. You could be the bad guy for going under budget. And you’re the greatest thing since sliced bread if you hit the budget right on the nose. (Mark3/2/15)

To survive in this environment, to be able to achieve the milestones that other managers in that position achieve as it relates to how the company or the upper managers perceive you. (Mark2/5/44)
Ron

The pressure is in keeping, keeping the program moving in the right direction.
And mostly where I’m concerned is hitting milestone schedules. (Ron3/7/3)

Tim

Managing a new project or managing multiple projects is … more stress on
me. I mean that’s something I don’t like. (Tim2/2/26)

Summary of Theme 4

As the engineers transitioned into management roles, they experienced increased
responsibility and ownership. As part of this there were deadlines and timeframes they
were responsible to meet. These elements of the engineering manager role resulted in
increased levels of pressure and stress for the managers.

Theme 5

Developing new skills: Discovered the need for a new set of skills as a manager.

5/5

This theme includes new skills that the engineering managers identified as
important. The need for these skills surfaced early in their transition. During an early
phase of the transition, they discovered the need to be able to do certain new things to be
effective in the role. The following three experiences cover the skill areas the managers
discovered a need for:

Experience 5.1: Need better people skills: as a manager a new set of people skills
are required
Experience 5.2: New administrative skills: had to run meetings, prepare agendas and use new software tools

Experience 5.3: Discovered the need for better communication skills

Each of these experiences will now be examined in more detail.

Experience 5.1

*Need better people skills: as a manager a new set of people skills are required.*

4/5

This experience reflects a need for new skills. Now that the engineering manager had to do things through others, they needed increased people skills. These skills included getting buy-in, motivating people, and other related skills.

Don

In the following quotes, Don discussed how doing engineering work was very different from managing other people. He found the change to be very hard:

I was just a little unprepared for that task because you know, actually doing the technical design or the logic design is very different [from] managing other people doing their design. (Don2/1/10)

One problem was … working with people…. how to motivate people … just to interact with people … I found that very hard, lot of trial and error kind of stuff … which technique worked with which people … getting their buy in into the task … to speed things up or to work overtime. (Don3/1/23)
Mark

Realization hit me … skills that I needed to develop and achieve were motivational skills. How to motivate people. How to excite other people into doing things that you would like them to do. (Mark2/1/33)

The varied personalities. Communication with various people. How much time you spend with each person. (Mark4/6/9)

Getting buy-in … have to be able to talk to other individuals and get consensus. (Mark4/6/1)

A lot of people skills that are necessary in order for you to be a manager. There’s a lot of different situations that you come across being a manager, regarding personal issues that you have to help people out with. (Mark2/2/32)

Larry

Problem Resolution. I think people should have some sort of training in that…. managing people, resolving problems amongst people. Engineers are great at solving problems but they’re not so great maybe dealing with people…. engineers mostly like to work alone, you know, sit in a cubicle and design something or program something or whatever. But they don’t interact very well sometimes with people. (Larry3/10/28)

Tim

Say that’s first and foremost, a lack of skill in the area of managing. (Tim3/1/40)
I’m an engineering background, you know, technical background. All my schooling and all my training has been from a technical standpoint, how to attack a problem, solve a problem and have reliable results. Now I’m asked to look at projects from a managerial standpoint, which really has it’s own skill set. So I feel that uh, you know, kind of behind in that skill set. (Tim3/1/22)

**Experience 5.2**

*New administrative skills: had to run meetings, prepare agendas and use new software tools. 2/5*

This experience demonstrates that as a manager, new administrative skills were required. For example, creating a meeting agenda and running a meeting were two such skills. These skills were not large challenges, but had to be learned quickly to be effective in the manager role.

*Don*

One of the things a Project Engineer does is usually chair status meetings or technical interchange meetings and all. Um, that was a little tough going at first. From going from just a participant in the meeting to actually being responsible for running it and putting together an agenda. Seeing that the meeting runs, ah, you know, doesn’t get sidetracked. Finishes in a reasonable amount of time that you’ve allocated. They were a little tricky at first but again you quickly learn tricks to do that. (Don3/5/37)
Tim

A tool set that I should have meaning knowledge on how to manage, how to do that kind of thing. And there’s another tool set of actual tools, that are available to me as a manager now [Microsoft Project for example]. (Tim3/1/28)

I have my challenges for the project to scope the job and that kind of thing. But now I have an additional headache as how to use that tool. So it’s kind of a double edged sword there. (Tim3/1/36)

Experience 5.3

Discovered the need for better communication skills. 2/5

As an engineer, communication and presentation skills were not used very much. This experience identifies the need participants felt to develop their communication skills.

Don

My communication skills probably weren’t that good. You know being an engineer and having a lot of work by yourself, you didn’t need tremendous communication skills. You know maybe you told your boss how things were going every once in a while. (Don2/3/40)

One other thing that I did now as an engineering manager that I did a lot more of than I did as an engineer was give presentations or talks in front of either higher management or in front of the customer. And I found public speaking has always been a challenge. I went to a public speaking course. I still find it
very unnerving. I still get butterflies and all. But I do much better at it now also. (Don3/3/30)

Mark

Be a good spokesperson. (Mark2/6/30)

Summary of Theme 5

The transition from engineer to engineering manager required that the new managers develop or improve certain skills in order to be effective. The new skills corresponded to the manager role of working primarily with people. In contrast, as engineers they were primarily focused on working with things. The new skills include the following areas: people, administrative, and communication. The managers recognized the need for these skills very early in the transition.

Theme 6

Resources and getting the work done: finding the time, the staff and other resources to get it done. 5/5

This theme was about the resource issues identified by the engineering managers. These include putting in more hours themselves, not having enough resources (generally staff) to do the work, trade-offs, getting less authority than expected, and the effect a downsizing (loss of staff). The experiences in this category were not identified as highly challenging issues but rather as common issues or experiences they dealt with. The experiences are:

Experience 6.1: Working more hours as a manager
Experience 6.2: Difficulty getting the resources to do the job

Experience 6.3: Trade-offs: can’t do everything 100%, must make judgment calls

Experience 6.4: Did not have the authority expected

Experience 6.5: Downsizing: difficult to see your organization go ‘down the tubes’ due to outside forces

Each experience will now be examined.

Experience 6.1

*Working more hours as a manager. 5/5*

This experience reflects the fact that the participants indicated they work more hours as an engineering manager. They didn’t necessarily like it, but it was their choice to work more hours and they took the job expecting to do so. They felt a need to spend the extra hours of work time to get everything done.

*Don*

One of the things that I expected that was the same, well, the more work. I expected there would be more work. Um, longer hours that’s pretty much how it is. (Don2/5/14)

*Mark*

The overtime that you have to work in additional hours which is not really something that I’m happy about doing at this stage of my life. (Mark3/3/29)
Larry

I mean, everything that I predicted in terms of the, the uh, job itself did come true. The longer hours … I’m working almost an 11-hour day. (Larry2/6/43)

Ron

These quotes from Ron show why he was working more hours. He had things that needed to be done, but during normal business hours he was in meetings or otherwise busy. He completed the additional things when others had gone home:

Sometimes it depends on what they’re doing and if you don’t have the staff. Sometimes you have to fall back and do things yourself. (Ron3/3/16)

Absolutely more hours. You know? I take things on myself, and say ‘All right, I’ll do this when everybody else goes home and I’ll knock it off and I’ll have it to you by close of business.’ Or as close of my business, you know. I may even email it out 6:30-7:00 that night but, you know, generally it’ll get done.

(Ron3/3/29)

Tim

Tim points out that the choice really was his to work the overtime:

Work overtime. Um, but you know, choices, my choice is to take that career path. So I’ll live with it … [it’s] my call to work the overtime. (Tim2/4/50)
Experience 6.2

Difficulty getting the resources to do the job. 4/5

This experience deals with the efforts of the engineering managers to get the staffing to do the work on their projects. They had to fight for resources in some cases.

Don

I knew a lot of things had to get done and I didn’t have enough people to do them. (Don3/2/45)

Mark

As technical staff was removed from the project, they would ask me to take all of the responsibilities. (Mark1/7/35)

In my position am responsible for everything … it’s difficult to be able to, you always have to beg you know, other people to work in your job. (Mark4/1/29)

Ron

For Ron the experience of getting resources related to working more hours. This was because he would do some tasks that would normally be delegated:

I wind up having to do more than I should…. something that would normally be delegated. But. uh, sometimes it depends on what they’re doing and if you don’t have the staff, sometimes you have to fall back and do things yourself. (Ron3/3/8)
In the following quote we glimpse the connection Ron saw between the organizational structure and the challenges he faced as a manager. The matrix organization has shared resources; the challenge was that he had to fight to get time allocated by the shared resources:

The matrix organization? On a purely business level, it makes sense, ok?, because we’re able to shift your resources and pull resources as you need ‘em, and then as you don’t need ‘em you give them back … That’s the good end of it. Personally, where you get a little frustrated, the frustrating part, is where you have to share resources…. you may have to fight sometimes for their time.

(Ron1/2/21)

Tim

This change in my status [to engineering manager] … the first thing I was saying was I need people to delegate to. You know you can’t expect me to do it all. (Tim2/2/5)
Experience 6.3

Trade-offs: can’t do everything 100%, must make judgment calls. 2/5

This experience identifies trade-offs as an issue the participants found frustrating. The limited resources forced them to make trade-offs and leave out things they desired in order to get the more important things done.

Don

I pride myself on getting all the details right. I mean that’s the hard part. Anybody can do the 90% job and then they screw up on the 10% implementation or whatever. And that’s what I felt I always did a good job. And yes, and that was something I could no longer do [the 100% job] and I found that frustrating. (Don3/4/23)

Mark

I’ve gotta do all of that and if I don’t do all of that, I do this thing that just came up from finance or this customer request that has to be handled immediately. Something is gonna suffer. Its always trade offs in this business. (Mark3/3/24)

Experience 6.4

Did not have the authority expected. 1/5

The participant expected a certain amount of authority. Instead, there was less authority and control of the resources than expected. This difference in authority affected
how he was able to do his job. In addition, he had responsibility for areas he did not expect to have.

Mark

I thought I would have more authority over the programs. (Mark2/9/46)

You think that when you go into become a … manager, you believe that you have a lot more power in the initial stages than you actually do. (Mark4/1/19)

Did not expect to have responsibility for some areas: such as the man loading, budgets, sales forecasts. So balance of responsibilities was different.

(Mark2/10/9)

Experience 6.5

Downsizing: difficult to see your organization go ‘down the tubes’ due to outside forces. 1/5

This experience highlights the unique dynamic of a downsizing. Shrinking budgets, losing staff, the organization you’ve had goes away. It was very challenging for the engineering manager in charge of the group.

Mark

In this quote Mark identified a financial issue, which affected the organizational structure he had created during a downsizing. He found it very ‘de-motivating’:

When funding went south, all of these things, the infrastructure that I designed went completely down the tubes, completely. That was a very, very downside to having an organization that was well tuned, fine tuned, and I thought it was
exactly what the customer wanted was a major blow. Almost to the point where I just wanted out as well. It was de-motivating. (Mark3/12/5)

Summary of Theme 6

The new managers were responsible for getting certain work done. They identified areas where it was difficult to get the needed resources to accomplish that work. The difficulties included having enough hours in the day to do their work, getting engineering staff, making trade-offs in the product, less authority than expected, and the effects of a downsizing. These challenges combined to provide a challenge for the managers in accomplishing their responsibilities.

Theme 7

The new guy in management: change from being a technical expert to being new in management and having a lot to learn. 5/5

This experience category summarizes experiences relative to being a new engineering manager. Each of the managers was promoted from within the organization. The experiences they had related to the change from being an experienced engineer and doing engineer work, to being a new member of management and doing the work of a manager. The experiences are:

Experience 7.1: Feeling like a novice: as a new manager you have a lot to learn

Experience 7.2: Those with a lack of mentoring found it tough: having good organizational support around you is important

Experience 7.3: No formal training or preparation: felt unprepared for the manager role
Experience 7.4: Desire and attempt to show management how to manage, to get them in touch with the engineer issues

Experience 7.5: Managing outside your area of expertise: had to quickly develop new domain knowledge

Experience 7.6: Perceived as a novice: Being treated like the novice by others

Experience 7.7: Difficult asking for help: considered it a sign of weakness

Each experience will now be examined.

Experience 7.1

*Feeling like a novice: as a new manager you have a lot to learn. 4/5*

The managers in the study had been engineers for an average of almost 18 years. They were considered experts in a technical area. Now they had transitioned into the engineering manager role. They thus had the experience of being a novice and the challenges involved with learning the new role. In many cases the participant felt they were ‘thrown into’ the new role. They had to learn quickly to become productive.

*Don*

In this comment by Don, we can see that he felt a bit overwhelmed when he was ‘thrown into’ the manager role:

Trial by fire. You’re just thrown into it and that’s it. (Don/2/8/44)

*Mark*

Mark identified the fact that he did not understand what he was responsible for. He had to learn what he was supposed to be doing each day and what areas he was responsible for:
When you go into [the new manager role] you don’t know all of the aspects you’re responsible for. Even though there’s a job description for each category. Those job descriptions don’t typically represent all that you do during the course of a day. It’s just a generic outline. (Mark3/5/29)

Larry

In this quote Larry’s phrase, ‘this is the way we do things,’ was a clear indication of the fact that he had to learn a number of different things about how to do the manager job. It also conveyed the feeling of being ‘thrown into’ the new role:

There was a little bit of a period there where, uh, uh, I was thrown into a totally new role … So I had to deal with people in … corporate center, the corporate office. And they have their way of doing things and their forms that have to be filled out, and, you know ‘this is the way we do things.’ you know, that kind of an attitude. So you just have to quickly ramp up to what it is they are expecting and what they want to see in order to keep them happy…. you’ve gotta learn. (Larry2/2/35)

The next two quotes provide indications of the need to quickly learn and become productive in the manager role:

So that’s challenging. Just trying to get to the same level of knowledge that they have in terms of defense agencies and defense offices and how they’re structured, who to call and who not to call. It’s always more important to know who not to call than it is who to call. Cause you don’t want to piss the wrong guy off. (Larry3/5/44)
Bam!—overnight, y’know, ‘here I come!’ Y’know. It hasn’t been a, uh, a graceful transition, so to speak. It’s been a---Boom!—overnight type of thing and now, I mean you got to hit the street running and try to get as much information as you possibly can as quickly as you can. But you gotta be careful how you do it: they’ll get turned off. (Larry3/6/23)

Tim

Tim realized that he had a lot to learn and relied upon help from others to gain this knowledge:

I’m the new guy and yes I have a lot to learn…. I’m not from a business school.

I don’t have a business degree. I’ve never taken courses in program management…. I need to be helped along. (Tim2/7/18)

Experience 7.2

Those with a lack of mentoring found it tough: having good organizational support around you is important. 4/5

This experience highlights the role of mentoring, or the lack of it. Those who had good mentoring indicated it was important and valuable. Those without it thought the lack of mentoring made it tough.

Don

When asked what things came to mind about the transition, he responded with the following statement about mentoring and role models:
Better mentoring. Just having a better role model would have helped tremendously. Like I said the only people that I had up until that point were very authoritative figures. (Don2/2/13)

The mentoring Don received was from two friends who did not work at his company. The following quotes show how this mentoring helped and why he believed he did not get mentoring from internal sources at his company:

It was [two friends] who were instrumental in helping me get over [a challenge]. (Don2/3/24)

Everybody at work that you would think that you could get that kind of um, mentoring at work which would be much better since they were directly in the process and knew the people. It just seems that everybody at work is always so busy. And they’re not available. So we never sit down and talk. I think if [his two friends] weren’t available; it would have made things much worse. (Don3/5/11)

Mark

Mark pointed out that he received little mentoring. He also suggested that competition and being too busy were some of the possible reasons why:

Was no mentoring in some areas to, in order to make me aware of some of the pitfalls that existed. (Mark3/5/33)

Unless you’ve had some mentoring with somebody that will advise you, someone that was not threatened by you raising up to a higher level, somebody that was gonna lift you up. Which typically in the areas that I was moving up
through it was like everybody was fighting to get up the ladder, so no one was willing to offer any assistance and help to you even if they did see that you were headed that you saw a light at the end of the tunnel and they didn’t tell you that at the end of the tunnel is a train. (Mark3/5/37)

Everybody [too busy], so no one was willing to offer any assistance and help to you. (Mark3/5/40)

*Larry*

Larry experienced fairly good mentoring from his manager when he started. But he had a tough time getting organizational support. In this first quote he provides an example:

Also the challenge is I guess being thrown in with what I call the Sharks—the other [managers] from the corporate level. Again, seasoned veterans. They know what they’re doing. They’ve got a lot of contacts ... They know who to call, who to see. So they have a leg up, so to speak. What I’ve done is I’ve gone to some of them and said, ‘Hey could you help me just break down how the [government department] is structured, so I don’t knock on the wrong door or poll the wrong guy and just get to a dead end every time.’... –‘Nah, I don’t have time for that. I have a customer meeting I gotta run to.’ And after two, three times you asking and then getting that response back, you realize ‘he doesn’t want to help me.’ (Larry3/5/29)
The statement below indicates the general attitude Larry experienced in efforts to get help from others in the organization. Unless you’re in the direct line of responsibility for others, they may not be very willing to help you:

If you’re not in their direct pecking order and they’re not directly involved with what it is that you’re doing, although on the periphery they are involved, ok?, they may not necessarily get back to you. (Larry3/6/41)

Tim

Tim had a good mentoring experience as the following statement shows:

I think I’m being fostered in a good environment to make the transition from engineering to engineering manager. (Tim2/9/6)

The comments below further identify what he does and his thoughts on his mentoring experience:

When I have the problem, and I voice the problem, yea I feel like I’m certainly being helped, being told where to look, where to get the information, how to call the information out of other people and what to look at. Absolutely, there’s no, I don’t have time for that. You’ve gotta figure that out yourself. I haven’t come across that at all. They want me to succeed. They need me to succeed.

(Tim2/7/32)

Experience 7.3

Managing outside your area of expertise: had to quickly develop new domain knowledge. 4/5
This experience reflects the situation in which a manager was responsible for a technical area they did not have expertise in. The participants felt it was important to learn enough so that they had an understanding of the concepts and words used. This helped them to understand what was being talked about, and enabled them to have some respect from the experts in the topic area.

Don

During the post-interview review of the analysis, Don associated himself with this experience and pointed to this from the interviews as a source to use:

My experience or my knowledge in terms of the whole job has broadened significantly such that I can answer you know, remedial mechanical questions, EMI questions, um, just running the job, the steps that need to be done, that kind of stuff. (Don2/7/31)

Mark

Mark had a hardware background. As a manager he had to supervise a group of software engineers. The following statement shows how he approached this:

I had to manage around 25 software people. And I had to understand software in depth in a different area…. had to come up to speed very quickly in order to have those people respect you. (Mark3/9/43)

Larry

The following quotes reveal the challenge Larry faced in trying to understand and work in an area where he had no previous expertise:
I’m an electrical engineer. I know nothing about photonics. I know nothing about—I hated physics. Got through it, but it’s not my forte. So I now am finding myself talking to in some cases PhD’s and guys that are pretty well seasoned in photonics, uh optics, and trying to grasp and keep up with them. Uh, it’s challenging. It’s tough. Uh, not only internally here, but we’re doing--we have some collaborative work that we’re doing with one of the local universities.... So that’s a challenge, trying to ramp up quickly with the photonics technology and the couple of guys that are working that area just so I feel that I’m at least on the same level in terms of understanding what they’re talking about. (Larry3/5/18)

Ron

The following statement from Ron identifies how managing a range of technical areas felt for him. In the second quote he provided an example of some of the areas he needed to understand:

Issues about being the single point of contact and feeling that you have to be the expert on absolutely everything. (Ron3/3/51)

What I do is manage a project, an entire project, which includes hardware, software, configuration control, reliability, quality, uh, all of the engineering disciplines. And specifically when you’re talking about hardware engineering or software engineering it gets even more detailed than that. So you have analog hardware, digital hardware, uh, you know, issues with PC board layout,
design and drafting, you know. You are surrounded by people who have very very specialized, uh you know, knowledge of responsibilities. (Ron3/4/23)

Experience 7.4

No formal training or preparation: felt unprepared for the manager role. 3/5

Some participants felt that they had not had the training or preparation needed for the new position. They felt their company could have better prepared them.

Don

When I was first going through the transition, as I explained before, I felt very frustrated. I didn’t like the idea that I had received no training and very poor role models to go by in performing this transition. (Don/2/8/44)

Mark

Mark identified his training as ‘the school of hard knocks.’

The school of hard knocks is tough. (Mark3/5/36)

Tim

During the validation interview, Tim included himself in this experience, even though in the interviews he did not specifically bring it up. The following statement shows indirectly that he felt he had a lack of training for the manager role:

A lack of skill in the area of managing. (Tim3/1/41)
Experience 7.5

*Desire and attempt to show management how to manage, to get them in touch with the engineer issues. 3/5*

This experience shows the desire of the new managers to do things the way they thought management should run things. In other words, to run management the way the engineer thought it should be run. In some cases they tried to help management get in touch with what was going on with the engineers.

*Don*

These two quotes from Don reflect his engineering view of management. When he started as a new manager he was going to manage the way he thought it should be done. The last line of the second quote shows that it turned out to be much harder than he expected:

> When you’re doing the engineering all the people above you that are managing you are nothing but jerks.... if I was just manager I could probably do a good job. Cause I know what’s going on. (Don2/2/51)

> I felt again, everyone that I had always worked under were an idiot and well of course, that I could do a better job if I was just given the chance. To my surprise when I was given the chance it was a lot harder than it looked. (Don2/8/34)
Mark

The quotes below show that Mark tried to correct things in management that he thought were wrong. Once in management, he began to learn that there are a lot more issues than he realized:

I tried to set my management straight that was above me of things that I saw that was wrong when I was in [engineering]. I tried to set to many things straight…. You have to be careful. So you’re not going to change the world over night. (Mark2/7/12)

I felt that I knew everything about what I needed to know. And it turns out I didn’t. I thought my boss was just not managing properly. I judged him, improperly. (Mark1/14/10)

I have seen other managers treat certain people in certain ways that I would never, never, in a million years decide that I would treat anyone. (Mark2/4/2)

It’s not an easy transition … initially the perception is that you’ll be able to go [into management] and then show up all those guys in management. It’s not that easy and I found that there’s a lot of other issues that I thought were kind of like a joke before such as all the aspects of corporate compliance. Very, very important I found. (Mark2/6/44)

Larry

The following quote from Larry shows the typical view of management held by engineers:
The general perception of engineers are, again the typical Dilbert, is that management is all screwed up and that’s all the problems in the world. Get rid of all the managers and everything will be Ok! (Larry3/9/9)

As a manager, Larry looked at what other managers did and disagreed with how they handled certain things. In particular, he thought some managers were ‘out of touch’ with things from the engineer’s viewpoint:

Now into that role, I’m now thrown into, let’s say, a variety of different situations at the management level. And I’m sitting there and I’m saying to myself. ‘Hey, this [manager] really screwed up!’ Ok? You’re now seeing close-hand what their thought process is and how they go about coming to certain conclusions or decisions. And at times I guess I felt that they were out of touch. (Larry2/3/20)

*Experience 7.6*

*Perceived as a novice: Being treated like the novice by others. 2/5*

This experience highlights the condition of new engineering managers and the perceptions of others toward them.

*Mark*

Mark had had experience with other managers who had the perception that he didn’t know what he was doing. They treated him like a novice and told him what to do:

Other managers who know more being happy when they can tell you what to do. (Mark3/3/6)
Perception of that is that you didn’t know what you were doing. And it’s probably true because you didn’t know what you were doing when you were going through it. So then people can develop a perception that you didn’t do the right thing. (Mark3/5/45)

Larry

In this quote, Larry provided a good example of being the ‘new guy’ changes how you are treated:

I had to be careful on how I approached that. You can’t just rebut somebody and say ‘You’re wrong, Y’know Joe is better at that than Harry,’ or whatever the situation is. So you felt sometimes stifled, and ‘Hey that’s a new guy, just ignore him. He doesn’t know what the hell he’s talking about’ sort of attitude. And slowly you just gotta work your way into that group, into that management group, and show that, ‘Hey y’know—my opinion is worth something and I have something to say here. (Larry2/3/20)

Experience 7.7

Difficult asking for help: considered it a sign of weakness. 2/5

This experience indicates the desire to solve the issues themselves rather than ask for help. Asking for help was viewed as a sign of weakness.

Don

Don did not let upper management know that he was struggling. He didn’t want them to think he wasn’t capable. In retrospect he knows they could have helped him, but as a new manager he didn’t want to ask for help:
I wasn’t giving visibility to the people above me as to how the job was going if I was in need of help, that they could have done something for me.  

(Don 2/3/48)

Mark

I found it personally difficult to [ask for help], I always wanted to do everything on my own, to not ask for help. Because I think that in people’s mind I think asking for help might be a sign of weakness, that you’re not able to achieve the goal.  (Mark 4/5/39)

Summary of Theme 7

The transition from engineer to engineering manager involved a change from being an expert to being a novice. The managers experienced the challenge of assuming an unfamiliar role and being the new guy in management. This involved feeling like a novice, needing mentoring and support, feeling unprepared due to no training, trying to influence the other managers, managing areas where you had no technical expertise, and not wanting to show weakness by asking for help. The experiences in this theme demonstrated the issues the new managers dealt with in their transition.

Theme 8

Organizational issues: In a new organizational level with its associated issues.

2/5

This theme combines four organizational issues, as the move to a new organizational level resulted in new organizational issues. These issues were distinct from
the experiences presented in Theme 7. Theme 8 combines organizational issues that appeared to be common for managers, regardless of how long the manager was in the manager role. Theme 7 combined the experiences specific to being new in management. The organizational issues in Theme 8 involved the interactions of the manager with other managers and the organization. The experiences are:

Experience 8.1: Had to deal to a greater extent with office politics

Experience 8.2: Being in the middle: you’re often between management and engineers or between management and customer

Experience 8.3: Ethical decisions are more important as a manager

Experience 8.4: Difficult person to deal with: Personnel issue

Experience 8.5: ‘No recourse for protecting yourself in a management role’

Experience 8.6: You represent the organization and sometimes the ‘customer is out to get you’

Each experience is examined below.

Experience 8.1

Had to deal to a greater extent with office politics. 2/5

This experience was not a large challenge for the participants, but the office politics were viewed as a daily annoyance or frustration.

Mark

Mark had a lot to say about office politics. The following are a few short statements:
Have to understand who’s who in the organization how they got there and politics. (Mark2/3/15)

A lot of political issues. (Mark3/6/7)

The blame game. (Mark4/7/20)

Political environment. (Mark4/5/27)

Everybody was fighting to get up the ladder. (Mark3/5/40)

**Larry**

The following quotes from Larry show the types of office politics he experienced once he transitioned into the management role. It included other managers trying to impress the boss and those who tried to make the boss happy (he called them ‘suck-ups’). He indicated that they weren’t big issues but they were annoying:

> I guess some of the common things that [happens] on a day to day basis that are I guess annoying or frustrating but in the big scheme aren’t that important: Office politics.... the, need to ‘Impress the Boss’ … not being part of the ‘In Crowd’ or the clique that’s been established over the last few years, in terms of the management circle.... There are certain secrets that are withheld, and by secrets it could be something stupid like ‘Well, I know where so and so’s going to be next week and you don’t!’ It’s like, well, Who Cares! You know? But to them it’s something that they have more information than you do on something. (Larry3/1/11)
At management meetings, there’s the typical suck-ups that will have to make their point with upper management. They have to constantly impress them about how on top of things they are, what they’re doing. And sometimes it’s totally irrelevant to the discussion, but they feel like ‘Oh my God, time’s running out and I haven’t gotten that point across yet, so I have to make my statement NOW.’ (Larry3/1/44)

**Experience 8.2**

*Being in the middle: you’re often between management and engineers or between management and customer. 2/5*

This experience demonstrates one aspect of the engineering manager role: being in between management and the engineers or the customer. Being in the middle means you can get it from both sides.

**Mark**

I don’t like being in the middle of everybody all the time where it’s difficult … sometimes either you appease the customer and not your own management or you appease your own management and not the customer. (Mark3/3/3)

Is having to negotiate between your boss and the customer and being put in the middle of all the different situations that happen. A [manager] has to deal with his boss, upper management, customer, people, the people that are there and the supervisor of those people to obtain resources to get the job done. And also bring in finance to bring the budgets in on time and on schedule. So there’s a lot of things. You’re like the nucleus of everything. (Mark4/4/12)
Upper managements activities reflects more directly on you for good or bad.

(Mark3/4/30)

_Larry_

The following quote was also used in Theme 7, Experience 7.1. It provides a unique perspective on the first line manager role. It shows how the first line manager is positioned in between the rest of management and the engineers:

We always had a joke in this place that the worst position in this company was First Line Supervision. Because you got it from both ends. You got it from the guys on top and you got it from the guys underneath! They’re stuck in the middle. And, uh, an old manager that I worked for fifteen or 20 years ago told me, ‘If you don’t think you can break through that first layer of management, don’t even make the attempt,’ he says, ‘Cause you’ll kill yourself!’

(Larry2/12/22)

_Experience 8.3_

_Ethical decisions are more important as a manager. 2/5_

The following quotes identify ethical decisions as increasingly important in management, much more so than when the participants were engineers.

_Mark_

Ethics become an important thing as a manager, much more so than as an engineer. (Mark2/7/1)
Larry

You know one of the things we always laugh about is Ethics. As an engineer you’re not exposed to situations where ethics maybe come into play. Ok? But the higher up you go, ethics do become a part of your job. You’re dealing with customers, you’re dealing with other companies, and you’re dealing with other executives of other companies. Ok. So, you have to deal in an ethical manner. I wouldn’t say the word Moral, but in a moral manner. (Larry3/11/12)

Experience 8.4

Difficult person to deal with: Personnel issue. 1/5

This experience identifies the experience one manager had with a problematic person in the organization.

Mark

The following quote provides some insights into Mark’s experience with this employee:

Some of the more severe difficulties … trying to deal with one particular individual which is a senior principal engineer … It wound up to be a very frustrating situation…. this problem existed prior to me getting there…. understanding what is going on and not being able to do anything myself about the situation. Having solutions to the situation and not being able to do it [because of organizational reasons] is very frustrating, very frustrating. (Mark3/8/10)
Experience 8.5

‘No recourse for protecting yourself in a management role.’ 1/5

This experience reflects the situation where a manager found that there was really no recourse to protect himself. As an engineer, the actual item designed, or the software written, showed exactly what the engineer did. As a manager, it was not always clear what you did or did not do. The manager had now way of protecting himself from statements by his manager.

Mark

The quote below demonstrates Mark’s concern about being at the mercy of having a good manager over him. He experienced getting treated unfairly in a number of situations:

Managers who like to say … it’s all you and if something goes wrong, its still all you and it’s all your problem. But if something goes right, almost that they take the credit … On the other hand, the next day maybe we’ll have a problem or something, they’ll say, yea that guy [Mark], we have a problem with him. He’s really screwing up there. But it’s a good thing I did this the other day because it will compensate for something you did this day. See, there’s no recourse sometimes for protecting yourself in this sort shouldn’t be, being in a management role position, to protect yourself can only get you in deeper.

(Mark3/3/36)
**Experience 8.6**

*You represent the organization and sometimes the ‘customer is out to get you.’*

1/5

This experience reflects a situation in which a customer relationship became bad, but there were still contractual obligations on both sides. The manager felt that the customer was out to get him.

**Mark**

[The customer] needed more money and they needed someone to blame in order to get the money. They would find things and try to justify blame.

(Mark3/12/31)

[Customer trying to ‘get [me]’] Now as time goes on, now I’m starting to step up and say wow they’re really starting to try to get me. (Mark3/12/37)

**Summary of Theme 8**

As a manager, the participants discovered that their change in position on the organization chart resulted in new issues or challenges. They had to deal to a greater extent with office politics, found themselves in between management and the engineers and/or customers, discovered a need for more ethical decisions, had to deal with difficult people in the organization, found themselves more vulnerable to their managers, and believed their customer were out to get them. These issues were not identified as the most challenging but still had to be dealt with.
Theme 9

Choosing the management career path: the concerns before deciding and questions experienced during or after the transition. 4/5

This theme reflects the issues the participants grappled with as they decided to leave the engineer career path and begin on the management path. Many of the same issues were concerns for each of the participants. The two experiences below represent the areas of concern for participants in the decision process. The first experience encapsulates issues considered prior to making the full commitment to become a manager. The second covers comments about how different it was from what they expected. The experiences are:

Experience 9.1: Making the decision: motivation and questions or concerns about going into management

Experience 9.2: It's different from what I expected

Each experience will now be examined.

Experience 9.1

Making the decision: motivation and questions or concerns about going into management. 4/5

As participants considered the positive and negative aspects of moving into management they had to make a decision. The process of getting to the decision, and then making it, was memorable for some of the participants. There are a few aspects or questions in this experience. These include motivation for making the transition, recognizing the significance of the decision to move from engineer to manager, the
impact of the transition on future employability, skill erosion or loosing technical edge, and income and benefit changes.

Each of these areas is now considered.

Motivation for going into management.

This aspect of the decision process deals with the individual motivations for moving into management. The participants discussed some of the reasons they accepted the opportunity to move into engineering management.

Don

This statement by Don shows his engineer view of the engineering manager role. It also identifies some of the reasons he chose to pursue the manager career path:

The prestige is or the real money only comes from going into the managerial positions. Yes, engineering managers get offices, engineers don’t. Engineering managers go to staff meetings where they decide where the company is going what business. Engineers don’t. Engineers are told you design this and that’s it. (Don2/4/38)

In addition to the statement above, Don also aspired to a leadership role as the following quote shows:

Well, I gotta admit the aspiration was always to be in charge of something. To be in control, to be that leader kind of figure. Yes that was always the aspiration. (Don2/4/45)
Tim

In the next quote, Tim indicates that he was not moving into engineering management because he liked the day-to-day activities. In fact, it was just the opposite. He was moving into management even though he didn’t like the management role as much. The reason was that there were other aspects, such as better money, that made the manager career track appealing to Tim:

All matters being equal [$], everything being equal just pick and choose I’d go the engineering route without a doubt. (Tim2/3/40)

[The choice to move into management was] a matter of better positioning, better income, more prestige, and on the other side is stress factor, that kind of thing. More responsibility, more things to worry about. (Tim2/4/55)

Recognizing the significance of the decision to move from engineer to manager.

The decision to enter a management role and leave the engineer role was a significant career choice. The quotes below show how the participants recognized the importance of the decision, and how they felt about it.

Larry

Moving into engineering management represented a significant career decision. The following quotes show the things Larry was thinking about as he considered making the change. It was primarily about the relationship changes:
Uncertainty? Am I doing the right thing? What’s going to be expected of me that’s different than when I was an engineer? How will people perceive me. (Larry2/1/10)

A lot of soul searching. I talked to the family a lot.... [the job will entail] long hours on my part, more travel ... I talked with colleagues and got their feedback.... The work was not a concern in terms of ‘Can I do the job?’ That never was really part of the equation. But, it was the surrounding things about the job—as I just mentioned: the hours, the relationships with the co-workers, and things like that that went through my head. (Larry2/3/10)

In the following quote, Larry shared a long-time manager’s view of the transition from engineer to engineering manager. The first level of management was specifically mentioned as a tough position to be in:

We always had a joke in this place that the worst position in this company was first line supervision [i.e. the first level you enter when an engineer transitions to management]. Because you got it from both ends. You got it from the guys on top and you got it from the guys underneath! They’re stuck in the middle. And, an old manager that I worked for fifteen or 20 years ago told me, ‘If you don’t think you can break through that first layer of management, don’t even make the attempt,’ he says, ‘Cause you’ll kill yourself!’ (Larry2/12/22)
Tim

The following comments by Tim show the significance he placed on the decision to change from an engineer to an engineering manager. He knew he wanted to go into engineering management, but he still had doubts about it:

There’s that fork in the road. Are you gonna stay and become an expert engineer or are you gonna move into a managerial path. (Tim2/7/48)

A career feeling. You know, personal issues are. First of all, am I going in the right direction? I mean, do I want to go into the management end as opposed to staying technical? (Tim2/2/22)

The overarching issue appeared to have been the long-term view of his career. What was the best career path to pursue? This is reflected in the following quote:

Am I doing the right thing, is this the best thing for me in my career?

(Tim2/3/3)

The impact of the transition on future employability.

This aspect of the decision process identifies the concern participants had about the impact this decision would have on their future employability.

Larry

[Interviewer] If you had to make the decision over again, would you do it? …

[Larry] My gut response is ‘No, I would not do it over again.’ That’s my gut response, ok? But I know in the long run, it was the right decision. Because I can use this as a stepping stone elsewhere. (pause) Yea—in some respects I
think I made the wrong decision. I should’ve just stayed where I was. As much as I hate to admit it, my wife always says I’m a, a Nerd at heart. You know. You just like to tinker and play and do that kind of stuff. And I can’t do that any more.... So, in that respect I probably made a mistake, but like I said, in the long run I think it’s a career path that was the right thing to do. (Larry2/10/27)

In the previous quote it appears that Larry was still somewhat torn. On the one hand, he regretted the move into engineering management. He misses the engineering role. But on the other hand, he believed and hoped that the move to engineering management was the right move for his career in the long run.

The following quotes provide additional background into the thought process behind his view that the management path was a better long-term career choice:

Where would I be more marketable? As an engineer or as some sort of a manager? And whatever the reason, I came to the conclusion that I might be better off taking [the engineering management] path … I can always market myself perhaps better as a manager of some sort. (Larry2/11/49)

Within [my company], it seems that it’s easy to move around as a manager as opposed to an engineer. Ok? Normally, in a large corporation, they’ll hire locally engineers—out of college, from other companies within a given area. What they like to do with their managers is train them into the corporate philosophy, the corporate way of doing things. And keeping them. You know. If we’re soft over here now, well, there’s always an opportunity in another
facility somewhere, if you want to move, relocate. So the options are more readily available. (Larry2/12/5)

Tim

Tim’s view of the long-term impact of going into management was the opposite of Larry’s. Tim believed that the engineering manager role would be a tougher career path, in the event that he must find a new job. In his view it was easier to get a job as an engineer, than as a manager:

This is a volatile marketplace.... in the event of unemployment, it would be difficult for me to get back into an engineering position. (Tim2/2/25)

The aspect of the potential income, discussed below, was what motivated Tim to overlook the future employability concern and pursue the engineering management opportunity.

Skill erosion or loosing technical edge.

This aspect of the decision highlights the issue of losing technical skills. Participants indicated that the pace of changing technology was fast enough that once you stepped out of the day-to-day work you lost your technical skills and your knowledge was obsolete. This was part of the reason why the decision to become an engineering manager was such a significant one. After a few years in the manager role, it would be very difficult to go back to being an engineer. The managers identified this issue and how it made them consider carefully their choice to pursue management.
Don

The transition to management skills. That’s the start of your technical skills decaying. You now as you lose the hands on experience you lose the ability to keep up with the technology. You know how to do it 5 years ago but in electronics, 5 years ago was ancient history. The parts now are all different. The techniques are now different. The manufacturing is different. So as soon as you stop doing that, forget it. You become a dinosaur. (Don1/12/39)

Mark

Am I’m gonna lose my [technical] edge? (Mark2/5/29)

Tim

Another thing that leads me towards staying more technical is skill erosion.... if I leave the technical field behind, those skills will erode and in addition to that, when you are an engineer, you need to keep abreast and actually increase your skills as you go along. I feel what would happen if I leave that behind is not only will what I have erode but I won’t have the opportunity to increase my skill set. (Tim2/2/25)

The next quote was from a discussion of the choice to go into management. Tim was looking at it from both short and long term perspectives. The long-term view pushed him toward staying an engineer. The short term pushed him toward management. Both were related to the money involved, but skill erosion tied directly into this since skill erosion was the problem he saw with going into management:
Long term … I’m afraid of skill erosion. And in short term, hey the moneys right there, the door’s open for me. I’ve got to walk through the door. And my personality is such that I’m gonna walk through the door. You know I’m not gonna sit back and say ok. No I’m gonna do the engineering work and let somebody else rise to the top of management and move on up and get the visibility going. (Tim2/2/53)

*Income and benefit changes.*

The participants identified the income and benefit changes as part of the decision making process. Some expected things to get better. One knew they would be less, but opted for the management route anyway, for other reasons that outweighed the income and benefits.

*Don*

Don expected to make more as a manager. He indicated that the changes were subtle and did not come until later:

When I first got put in this role there was no salary increase. There was no ok, Joe you’re a manager now and clear out an office or anything. Nothing changed. In other words from when I was a design engineer to when I was managing my first job, nothing changed. They just told me Joe, you’re gonna be in charge of this one. And that was it. So there was no salary change. There was no benefits at all associated with that. Um, after I did the first job and all. I guess those things didn’t come until later. You know I guess that was one of the things that I didn’t expect. I thought those benefits and higher salary and
things would come right away, commensurate with the job function and they
didn’t. (Don2/5/37)

The change [in salary, benefits etc.] was subtle not as dramatic as I thought.
(Don2/5/51)

Other things, besides the income, that did change are discussed here. Don
identified some advantages of the manager role:

The managers that get the offices. Now even if I’m getting paid the same
amount, if I’m sitting at a desk at a cubicle and somebody else has got a bigger
office with office furniture and speakerphone and I don’t. Even if we’re getting
paid the same the prestige is not bad. (Don2/4/50)

Larry

For Larry the income and benefits were also important. However, in his case it
was the opposite of the others. He took a pay and benefit reduction, and was working
more hours:

It was a big change in benefits! I mean I had to weigh the pros and cons of just
the benefits! Uh. Believe it or not, the Engineers Union benefits are better in
some cases than in the non-union uh benefit package. (Larry1/9/23)

Pay. There, because our engineers that get paid [overtime], there are actually
engineers that get paid more than I do. And I knew that was going to happen. I
told my wife, I’m better off where I am, because I’ll get paid overtime if and
when it’s needed. And I will not [as a manager]—I’m working almost an 11-hour day. (Larry2/6/43)

Despite the income and benefit issues, Larry’s view of his long-term career helped him overcome these issues and he moved into management anyway.

Tim

The following quote from Tim makes it really clear that he was going into management for the opportunity to increase his income:

I come to work for one reason, and the one reason is so that I can make money to live and to support my family. My number one goal is to maximize my income. And I think going managerial route, is the best path to success and by success I mean maximizing income. That’s what I’m here for and if that’s the way I have to go, that’s heavily weighted in the decision process of which way to go. (Tim2/2/45)

Experience 9.2

Its different from what I expected. 2/5

This experience ties into many of the other experiences. The managers had committed themselves to the management career path, but discovered that some things were not as expected.
Don

Don identified a few things about the transition, which were different than he expected. The following statement, used with experience 3.1 regarding delegation, shows that working through other people was much different for Don than he expected:

Responsible for the work of other people. That was a big change for me and it was more of a mindset change.... now I had to work through other people to get things done. That was very hard to take at first. (Don1/7/8)

Another quote, showing that aspects of the job were different than Don expected:

[The job] was a lot harder than it looked. (Don 2/8/34)

Larry

The following quote from Larry is a good example of how the manager job was different from what he expected:

I don’t think anything’s been the same as what I expected. Uh, I mean, it’s constantly different. It’s uh, not a day goes by where I say, ‘Man, this is really not what I thought it was going to be like.’ (Larry2/4/34)

Summary of Theme 9

The participants had been engineers for an average of almost eighteen years. The decision to leave the engineer role and start on the management career path was a significant career decision. Once they started down the management path, they understood it would be difficult to return to being an engineer. When the opportunity to
move into management came along, the participants had questions or concerns about what this change would mean for them. It was interesting to note that once they were engineering managers, they found it different from what they expected. This theme identifies the concerns they had as they considered making the transition and how the manager role was different from what they expected.

Table of Experiences and Themes

Due to length, the Table of experiences and themes is in Appendix B.

Summary of Research Question 2

This section discussed the experiences of the engineers who transitioned into management. Forty-five experiences were distilled from the interviews. These experiences represent what the managers encountered in the transition from engineer to manager. The experiences were combined into nine themes. The themes present groupings of common experiences for the managers in the study. The experiences and themes together answer research question number two. The themes are restated as follows:

Theme 1 – So much going on: the engineering manager role involves balancing many more responsibilities, tasks and priorities than the engineering role

Theme 2 – Relationship changes: Personal relationships, interaction dynamics and engineer perceptions of you have changed

Theme 3 – Delegation: the challenge of leaving the hands on technical behind and learning to work through others

Theme 4 – Increased stress and pressure associated with increased responsibility
Theme 5 – Developing new skills: discovered the need for a new set of skills as a manager

Theme 6 – Resources and getting the work done: finding the time, the staff and other resources to get it done

Theme 7 – The new guy in management: change from being a technical expert to being new in management and having a lot to learn

Theme 8– Organizational issues: In a new organizational level with its associated issues

Theme 9 – Choosing the management career path: the concerns before deciding and questions experienced during or after the transition

In the next section, the themes just presented will be discussed in terms of what the managers found the most challenging about the transition.

Research Question 3

What did engineering managers find most challenging or difficult about the transition from engineer to engineering manager?

This section presents the results relative to research question three. The results are divided into two areas below. First, the most difficult themes are discussed. This includes the comments from the participants and comparison of the individual manager responses. Second, the manager feedback and ranking of all the themes is presented.

The individual items discussed below show what it was about the transition, which the managers each found most challenging.
What the Managers Found Most Difficult

The managers each identified what they found most difficult during the interviews. During interview three they were asked the following question: *Think back to the single most difficult thing about your transition from engineer to engineering manager. It may have been something you found challenging, a barrier you faced or a situation or experience you had. It could be a single event or perhaps a new responsibility that was particularly difficult to adjust to. Please provide as much detail as you can regarding this single most difficult thing about your transition.* The responses to this question identified what the participants found most challenging about the transition. The biggest challenge for each manager is discussed below.

*Don*

Don identified Theme 3 – Delegation: the challenge of leaving the hands-on technical behind and learning to work through others, as the most challenging. The quote below shows his response to the question:

The single most difficult thing was just the frustration I felt in trying to get things accomplished that I couldn’t personally do. I found that to be the one single biggest thing that I had trouble with. I could do it myself. If I was running into problems like take the example I just gave you where I was running 2 weeks late and I knew I only had a week to do it, well I would call my wife, tell her I won’t be home for a couple of days. I’d work you know, all night. Or whatever had to get done and I would do it. I would do it. And I could do that whereas now I couldn’t do that anymore. No matter how hard I
worked or how much overtime I put in, it wasn’t being applied to the tasks at
hand that needed to be done because they were other people’s responsibility.
(Don3/3/13)

Mark

Mark’s most challenging transition item was Theme 1 – So much going on: the
ingengineering manager role involves balancing many more responsibilities, tasks and
priorities than the engineering role. The following quotes show Marks comments in
response to the question of what was most challenging:

Have to understand the accounting side. And you have to understand the
contractual side. And um, work across other boundaries outside the company.
In other words, with other divisions, with multiple customers at the same time
and be able to manage the overall program management experience. So that’s
pretty much the most difficult I think area. (Mark4/1/23)

That’s the most difficult thing that I’ve experienced when going into figure out
your boundaries. Because I’m the type of guy that will just get in and try to
figure out everything. (Mark4/2/43)

Larry

Larry’s response shows that Theme 2 – Relationship changes: Personal
relationships, interaction dynamics and engineer perceptions of you have changed, was
the most challenging for him in the transition. The following quotes show how the
relationships he had with the engineers from years of working together, and then having
to make decisions about who would be let go during the lay-off, were very difficult:
Without a doubt, it was my first lay-off. Having to go through my first lay-off.... people and co-workers that you’ve worked with for your whole career. So you’re looking at these names and you’re trying to weigh one name against another name, saying ‘He should go’ or ‘He should stay.’ And it’s very difficult. (Larry3/1/44)

It’s difficult because you know these guys personally. It’s easy when you’re detached from it and you don’t know them. It’s easy when a guy comes in from the outside to run a business and to him they really are just a bunch of names on the board. Ok. But when you know, you know, the guy, and you’ve met his family, and you’ve met the kids and you’ve maybe even played you know over the years, you know the kids somehow linked up and they were playing sports together or whatever, it’s difficult. It’s very difficult.

(Larry3/2/7)

**Ron**

During the interviews Ron identified Theme 2 – Relationship changes: Personal relationships, interaction dynamics and engineer perceptions of you have changed, as the most challenging. The following quote is from his response to the question of what was most difficult:

[The] transition is the dynamics of how you interact with engineers, from peer to supervisor. (Ron3/2/16)

In the following quote, Ron identifies the top three most difficult things for him. First, the relationship aspect, which is Theme 2. Second, Theme 1, what he calls
‘working and managing.’ And third, delegation, which is Theme 3. The statement was made after a discussion of what was most challenging and then follow-up questions about what other things also were very challenging. Ron provides a good summary statement of what he found most challenging:

The peer-subordinate [relationship] was probably the most challenging I think.
And the second was working and managing, I would think. And that goes hand in hand with delegation. (Ron3/6/8)

It is important to note that during the post interview follow-up, Ron selected Theme 1: Too much going on: Multiple things to focus on and balance, as the most difficult and Theme 2 as his second most difficult. The researcher’s views on this will be discussed in chapter five.

Tim

Tim’s biggest challenge was Theme 1 – So much going on: the engineering manager role involves balancing many more responsibilities, tasks and priorities than the engineering role. The quotes below work together to show that he had too much to do and couldn’t get to it all. One part of this was that his management responsibilities were taking all his time and he was not getting the lingering technical aspects done:

The most difficult thing, as this transition goes on [is that] I’m still responsible for technical work but I’m not getting to it, it’s not getting done. (Tim3/4/48)

In addition, Tim discussed the challenge of constant interruptions and having to jump quickly from one item to another. He dropped everything to handle one problem and was part way into solving that when another problem came up with something else,
so he had to do a quick patch to the first problem and move to the next issue, which
would most likely be interrupted as well. Thus, not only did he not have time to do some
of his tasks, but he wasn’t able to ‘put to bed’ or fully complete things that needed his
attention:

I don’t have that quick, the ability to quickly change my focus, attack a
problem, just, you know, brainstorm it for 3 days and work it, work it, work it
till it’s done and put it to bed. And that’s the biggest challenge I have.

(Tim3/5/16)

Summary

The preceding statements by the five managers show that the transition from
engineer to manager was a difficult challenge for these managers. The following quote is
a good summarizing statement. It helps demonstrate that the overall transition was tough:

Not really that many easy things. It’s a tough transition. I found it to be tough.
My perception of it was that it would be easier than what it was when I got
there. (Mark4/9/37)

Table 14 presents themes 1, 2, and 3 in terms of what was the most difficult.
Table 18 in chapter 5 provides additional summary information about the most difficult
challenges.

Ranking the Challenge of all the Themes

The themes resulting from the analysis of the interview data were presented to the
managers. The managers were asked to rank them, in order of difficulty, based on their
personal transition. If a given theme was something they experienced but did not consider
difficult or challenging they were asked to identify it as such. The ‘not difficult’
categories were given an asterisk in Table 14 below.

Table 14

*Themes Ranked by Order of Difficult for each Manager*

<table>
<thead>
<tr>
<th>Theme</th>
<th>Difficulty rank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Larry</td>
</tr>
<tr>
<td>1. So much going on: the engineering manager role involves balancing many more responsibilities, tasks and priorities than the engineering role</td>
<td>2</td>
</tr>
<tr>
<td>2. Relationship changes: Personal relationships, interaction dynamics and engineer perceptions of you have changed</td>
<td>1</td>
</tr>
<tr>
<td>3. Delegation: the challenge of leaving the hands on technical behind and learning to work through others</td>
<td>3</td>
</tr>
<tr>
<td>4. Increased stress and pressure associated with increased responsibility</td>
<td>5</td>
</tr>
<tr>
<td>5. Developing new skills: discovered the need for a new set of skills as a manager</td>
<td>4</td>
</tr>
<tr>
<td>6. Resources and getting the work done: finding the time, the staff and other resources to get it done</td>
<td>7</td>
</tr>
<tr>
<td>7. The new guy in management: change from being a technical expert to being new in management and having a lot to learn</td>
<td>8</td>
</tr>
<tr>
<td>8. Organizational issues: In a new organizational level with its associated issues</td>
<td>6</td>
</tr>
<tr>
<td>9. Choosing the management career path: the concerns before deciding and questions experienced during or after the transition</td>
<td>*</td>
</tr>
</tbody>
</table>

*Note. * indicates that the manager did not chose to rank the theme as difficult.*
Summary of Research Question 3

The quotes, together with the rankings in Table 14, show what the managers found most difficult. This is discussed further in chapter 5.

Chapter Summary

Study findings were presented in this chapter. Research question 1 was presented using the case studies and cross-case analysis. Research question 2 was addressed by presenting experiences and themes. Research question 3 was discussed by providing quotes from the managers and the results of the manager rankings of the themes. The conclusions, as related to the data presented, are presented in chapter 5.
CHAPTER 5

Study Overview, Conclusions and Recommendations

This chapter builds on the data presented in chapter 4. It presents the researcher’s conclusions and recommendations based on the findings. The chapter is organized into the following sections: an overview of the study, conclusions presented in the context of the research questions, recommendations to various groups based on the study’s findings, and a summary of the study.

Study Overview

The purpose of this study was to explore the experiences and challenges of engineers in the transition from engineer to engineering manager. Literature on engineering and engineering management consistently suggested that the transition was difficult (a few examples include: Badawy, 1995; Lewey & Davis, 1987; Rosenbaum, 1991; Thamhain, 1992). Despite frequent reference to the difficulty of the transition, little research-based information was available regarding what the engineers found difficult. Instead, limited anecdotal evidence was offered regarding why it was difficult. Thus, a research-based exploration of what individual engineering managers found difficult in the transition from engineer to manager was warranted.

This study focused on the experiences and challenges of engineering managers in aerospace companies on Long Island, New York. The difficulties of the transition were a phenomenon experienced at the personal level. Studying this required gathering data
from individuals who had been through the transition. A specific industry and geographic location were selected to narrow the scope of the study and provide clear focus for the findings.

The study was carried out using a qualitative methodology—interviews—in the tradition of phenomenology. The phenomenon under consideration was the transition experience of engineers moving into engineering management. One limitation was its focus on one industry in one geographic location. Another limitation, common to the chosen methodology, was that the results are not generalizable to a population.

Interviews were conducted with five engineering managers. An interview guide structured each of the interviews. Each interview lasted 60-90 minutes and was recorded and subsequently transcribed. The transcriptions provided the major data source. The interviews with each manager were carried out over a period of a few weeks. All the managers were interviewed between June 2001 and September 2002. Managers were selected for participation in the study because they satisfied predetermined criteria for inclusion.

The results of the interviews included the experiences of the managers regarding their transition from engineer to manager. The data gathered provided the information needed to answer the research questions directing the study.

1. What is the job related context of the managers during the transition from engineer to engineering manager? Specifically, what are the managerial job functions, career progression, likes and dislikes about their engineering and manager roles, and the timing and duration of the transition, in order to understand the context for the experiences and challenges explored in questions two and three?
2. What are common experiences for engineers who transition to engineering manager?

3. What did engineering managers find most challenging or difficult about the transition from engineer to engineering manager?

The transcribed interviews were analyzed and organized to answer the research questions. Study findings include 45 experiences identified by the managers. The experiences were grouped into 9 themes. The results were presented to the managers, who validated them and ranked the themes according to difficulty for them personally. Three themes were considered the most difficult aspects of the transition. These were:

Theme 1 – So much going on: the engineering manager role involves balancing many more responsibilities, tasks and priorities than the engineering role.

Theme 2 – Relationship changes: Personal relationships, interaction dynamics and engineer perceptions of you have changed.

Theme 3 – Delegation: The challenge of leaving the hands-on technical behind and learning to work through others.

The remaining themes, while not identified as the most challenging, were still considered difficult by some or all of the managers. The other themes included the following topics: Theme 4 – increased stress and pressure, Theme 5 – developing new skills, Theme 6 – resources, Theme 7 – the new guy in management, Theme 8–organizational issues, and Theme 9 – choosing the management career path.

An additional finding involved the common experience of spending years in the transition. During this time the engineer was doing both engineering and manager work, or exclusively manager work, but without the formal title of a manager. The experiences,
themes and other findings provided valuable information regarding the transition experiences of the five engineer managers.

Conclusions

The conclusions are based on the data presented in chapter 4. These data were generated from interviews with engineering managers regarding their transition experiences. The interviews were analyzed and organized as shown in chapter 4. The following is a discussion of the conclusions resulting from those findings. It is organized around the research questions.

Discussion of Research Question 1

What is the job-related context of the managers during the transition from engineer to engineering manager? Specifically, what are the managerial job functions, career progression, likes and dislikes about their engineering and manager roles, and the timing and duration of the transition, in order to understand the context for the experiences and challenges explored in questions two and three?

The data collected for this question primarily provided background information on the managers and set the context for analysis of their experiences and challenges. The main source of information was the first interview. The first interview guide contained three questions. The primary purpose of these questions was to collect information that would answer research question one. While the purpose was primarily to establish background information and context, three items surfaced that should be discussed as conclusions since they provided valuable insights. Two of the items related primarily to the career progression. These were not the primary focus of the research and not enough
information was collected to provide solid conclusions. However, there is enough to identify the possible issues and point out tentative conclusions and suggest further research. The first career progression item is the long period of time over which the managers had worked as an engineer. The second is the time during the transition when they were doing both jobs. The third item discusses the assumption that the transition was difficult and how that assumption was valid. Each of these three items will now be considered.

The data in the cross-case discussion showed that each of the managers spent many years as an engineer—an average of over seventeen years. In the researcher’s view this was significant. Prior to entering the transition, the managers probably had well-established work patterns and relationships within the organization. It was unlikely they would have stayed in the engineering role that long if they had not enjoyed it. Their comments about what they had enjoyed about the engineer role also supported the assertion that they enjoyed being engineers. The long period as an engineer, with the related establishments of habits, relationships and satisfactions, probably contributed to the difficulty of changing to the manager role. The role change may have disrupted these established feelings.

The case summaries and cross-case discussion showed that the managers spent an average of over three years in the transition phase. In the researcher’s view, this was a significant aspect of the transition. Two experiences from chapter 4 suggest that this overlap period may be a critical phase of the transition. The two experiences are: (1) 1.5 Difficult to maintain two distinct roles during transition: working as an engineer and as a manager; and (2) 3.1 Working through others: a mindset change from ‘doing’ to
‘managing’. It is interesting to compare Tim’s comments about the challenge of having both technical and managerial work, with Don’s and Ron’s comments about the key point in their transition, which was when they were forced to alter their mindset, resulting in the choice to do no more technical work. These experiences focused attention on work duties and suggested that while they had to maintain both roles, a point was reached when they internally made the change from the engineer mindset of doing themselves to the manager mindset of doing through others. More research needs to be done on this part of the transition and is suggested in the recommendations section. A closely related aspect of this transition phase was that by the time the managers received the formal promotion to the manager position, most were doing 100% management activities, sometimes for years. The argument could be made that this is the key sink-or-swim period. If an engineer is still interested in the management path at this point, they ‘swam’ and were formally promoted. If they did not handle this period then they ‘sank’ and return to engineering. This study only considered those who swam, but the comments of the participants suggested that this was an important time in the transition, so it is suggested as an area for more research in the recommendations section.

This study presupposed that the transition was difficult, based on the literature review and the experiences of the researcher in his own transition from engineer to manager. The data showed that this assumption was valid. In the case summaries contained in chapter 4, quotes from each participant were provided. Here are just a few small excerpts: (1) “trial by fire” (Don/2/8/44), (2) “not really that many easy things, it’s a tough transition” (Mark4/9/37), (3) “a big transition” (Larry2/1/25), and (4) “difficult” (Tim interview one notes). These excerpts, and the more complete quotes in chapter 4,
show that for the managers in the study, the transition was difficult. This finding also suggests that the comments in the literature about the transition being difficult for engineers may be valid.

**Summary of Research Question 1**

In this section the conclusions relative to research question 1 have been discussed. The first had to do with the long period as an engineer and how that may have been a contributing factor to the difficulty of the transition. The second was the transition phase when the participant was doing both engineering and management and the suggestion that this may be a critical period in the transition. Third and finally, the assumption that the transition was difficult was valid for the managers in the study. Conclusions for research question two are addressed next.

**Discussion of Research Question 2**

*What are common experiences for engineers who transition to engineering manager?*

This section presents conclusions relative to research question 2. The section is organized as follows: first, an introductory discussion of the question; second, a presentation of the experiences identified by a majority of the managers and some numerical information about the experiences; third, the themes are discussed; fourth, a comparison of the experiences and themes to findings from Hill (1993); and finally, a summary of the conclusions for question 2.

The answer to the second research question provided insights into the transition experience. The managers discussed their experiences during their transition. Through
analysis and comparison of multiple managers, valuable insights into the nature of the
transition were discovered. It is worthwhile to note that the managers knew a focus of the
study was the challenging nature of the transition. This knowledge, together with the
likelihood that they were probably unlikely to discuss mundane experiences, suggested
that the experiences discussed here reflect common memorable or challenging
experiences.

Experiences

In chapter 4, all experiences identified were included in the data presentation. The
discussion below focuses on experiences identified by a majority of the managers. These
are referred to as common experiences for the managers who participated in the study.
Interview two and parts of interview three were designed to gather information to answer
this question.

Table 15 presents the experiences supported by three or more managers. The
experiences are ordered by the number of managers who identified the experience. They
are further ordered by the difficulty of the theme they are associated with, as identified by
the managers. This table provides an excellent snapshot of the common experiences
identified by the managers. It is significant to note that four of the six experiences
associated with all five managers are also associated with the three most difficult themes.
The 20 experiences in Table 15 represent what the researcher believed to be the common
experiences of the managers in the study. Other experiences, identified by one or two
managers, probably were also experienced by other managers who did not identify them.
However, the criterion used was that the manager had to identify the experience clearly in
the interviews, or specifically add themselves to an experience during the follow-up meeting.

Table 15  
*Common Manager Transition Experiences Ranked by Frequency*

<table>
<thead>
<tr>
<th>Experience</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experience 1.1: Change from a primarily single focus engineer role to a</td>
<td>5</td>
</tr>
<tr>
<td>broader, multiple focus managerial role</td>
<td></td>
</tr>
<tr>
<td>Experience 2.1: On a different organizational level: no longer “one of the</td>
<td>5</td>
</tr>
<tr>
<td>guys”, instead perceived as ‘one of them’, the enemy</td>
<td></td>
</tr>
<tr>
<td>Experience 3.1: Working through others: a mindset change from ‘doing’ to</td>
<td>5</td>
</tr>
<tr>
<td>‘managing’</td>
<td></td>
</tr>
<tr>
<td>Experience 3.2: Enjoyed the technical work and miss the satisfaction of</td>
<td>5</td>
</tr>
<tr>
<td>doing the hands-on work</td>
<td></td>
</tr>
<tr>
<td>Experience 4.1: Increased responsibility: ownership of something much</td>
<td>5</td>
</tr>
<tr>
<td>larger and impact of decisions increased</td>
<td></td>
</tr>
<tr>
<td>Experience 6.1: Working more hours as a manager</td>
<td>5</td>
</tr>
<tr>
<td>Experience 3.3: Letting engineers do their own design: Overcoming the</td>
<td>4</td>
</tr>
<tr>
<td>feeling that ‘my way is better’ or ‘I’d get it done faster’</td>
<td></td>
</tr>
<tr>
<td>Experience 4.2: More pressure and stress</td>
<td>4</td>
</tr>
<tr>
<td>Experience 5.1: Need better people skills: as a manager a new set of people</td>
<td>4</td>
</tr>
<tr>
<td>skills are required</td>
<td></td>
</tr>
<tr>
<td>Experience 6.2: Difficulty getting the resources to do the job</td>
<td>4</td>
</tr>
<tr>
<td>Experience 7.1: Feeling like a novice: as a new manager you have a lot to</td>
<td>4</td>
</tr>
<tr>
<td>learn</td>
<td></td>
</tr>
<tr>
<td>Experience 7.2: Those with a lack of mentoring found it tough: having good</td>
<td>4</td>
</tr>
<tr>
<td>organizational support around you is important</td>
<td></td>
</tr>
<tr>
<td>Experience 7.3: No formal training or preparation: felt unprepared for the</td>
<td>4</td>
</tr>
<tr>
<td>manager role</td>
<td></td>
</tr>
</tbody>
</table>
Experience 9.1: Making the decision: motivation and questions or concerns about going into management  
Experience 1.2: Required to balance and prioritize many tasks and roles  
Experience 1.3: Interruptions frequently occur and require you to drop what you are doing and respond immediately  
Experience 1.4: Meetings demand much of your time  
Experience 2.2: Resentment or jealousy by some engineers that you were promoted instead of them  
Experience 7.4: Desire and attempt to show management how to manage, to get them in touch with the engineer issues  
Experience 7.5: Managing outside your area of expertise: had to quickly develop new domain knowledge  

A second way to consider the experiences was to examine how many experiences were associated with each number of supporting managers. Table 16 shows that 20 of the 45 experiences were identified by a majority of the managers. These 20 are the experiences listed in Table 15.  

Table 16  
Number of Experiences Identified by each Number of Managers  

<table>
<thead>
<tr>
<th>Managers identifying the experience</th>
<th>Number of experiences</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>1</td>
<td>9</td>
</tr>
</tbody>
</table>

219
Themes

The themes are a representation of the experiences. The 45 experiences were organized, during the analysis, into nine themes. The themes grouped together related experiences. These groupings showed patterns as well as simplified the data presentation. The themes were discussed in chapter 4. The themes are again discussed below in reference to research question 3. The themes were also a way to view the common experiences of the managers. Table 17 presents the themes and the number of experiences associated with each theme.
Table 17

*Number of Experiences in each Theme*

<table>
<thead>
<tr>
<th>Theme</th>
<th>Experiences</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. So much going on: The engineering manager role involves balancing</td>
<td>6</td>
</tr>
<tr>
<td>many more responsibilities, tasks and priorities than the engineering role.</td>
<td></td>
</tr>
<tr>
<td>2. Relationship changes: Personal relationships, interaction dynamics and engineer perceptions of you have changed.</td>
<td>10</td>
</tr>
<tr>
<td>3. Delegation: The challenge of leaving the hands on technical behind and learning to work through others.</td>
<td>4</td>
</tr>
<tr>
<td>4. Increased stress and pressure associated with increased responsibility.</td>
<td>2</td>
</tr>
<tr>
<td>5. Developing new skills: Discovered the need for a new set of skills as a manager.</td>
<td>3</td>
</tr>
<tr>
<td>6. Resources and getting the work done: Finding the time, the staff and other resources to get it done.</td>
<td>5</td>
</tr>
<tr>
<td>7. The new guy in management: Change from being a technical expert to being new in management and having a lot to learn.</td>
<td>7</td>
</tr>
<tr>
<td>8. Organizational issues: In a new organizational level with its associated issues.</td>
<td>6</td>
</tr>
<tr>
<td>9. Choosing the management career path: The concerns before deciding and questions experienced during or after the transition.</td>
<td>2</td>
</tr>
</tbody>
</table>

The data show that there was not a uniform distribution of experiences in each theme. The focus of the theme creation was to create themes that “seem to comprise a whole picture” and have ‘external heterogeneity’ (Patton, 1990, p. 403).

As mentioned in the preceding paragraph, one objective was to present a complete picture. The themes combined and interrelated in various ways. Each presented a unique
aspect of the transition experience, but certain themes were also closely related. According to the researcher, three theme relationships should be discussed.

First, Theme 4 (pressure and stress) was probably related to many of the themes. However, it was clearly aligned with Theme 1, which dealt with so much going on. Theme 1 probably caused a good portion of the stress and pressure reflected in Theme 4. A second theme relationship, Theme 1, appeared related to Theme 6, which dealt with having the resources necessary to get the job done. In the researcher’s view, not having the resources needed to get a job done could certainly add to the level of stress and/or pressure felt by the manager. And the third theme relationship, Theme 5, regarding the need for new skills, was related to Theme 7, being the new guy in management and having a lot to learn. Theme 5 was retained as a separate theme because it dealt with specific skills for which training could be provided. These three theme relationships show the linkages among themes. Recognizing the ties among the themes was important for understanding the challenges of the transition. However, having the related themes as independent items was valuable since they presented different aspects of the transition.

In the opinion of the researcher, there were two higher level, or meta-themes. These should also be discussed along with the themes. The first meta-theme was that the transition from engineer to manager was difficult for the participants. As covered in the discussion of research question 1, this was a presupposition of the research. This assumption was validated and supported by the manager’s transition experiences. The second meta-theme was that the manager role was different than expected. Specific statements about this led to the identification of experience 9.2. However, other themes implied that the job was different from expected. For example, Theme 1 contained
experiences and quotes from the managers, which demonstrated, that the manager job was different than they expected. In addition, Theme 2 suggests that the managers were surprised by the nature of the relationship change with their former peers. It was not what they expected to happen. These two meta-themes were important aspects of the transition.

Comparison with Hill (1993)

One of the literature sources identified in the foundational section of chapter 2 was Hill (1993), *Becoming a Manager: How New Managers Master the Challenges of Leadership*. In this book Hill presented the results of a study of newly promoted managers in the sales function of a financial services firm and a computer company. The goals and methods of the research were close to those of this study. The difference was that the participants were in different industries and different organizational functions. The following is a summary of points of comparison between the findings of the two studies.

Theme 1 – So much going on: the engineering manager role involves balancing many more responsibilities, tasks and priorities than the engineering role. Hill called this “role strain” (p. 191). Here are a few quotes: (1) “Workload and pace of managerial work … struck by the unrelenting workload and pace of being a manager” (p. 54), (2) “Most described themselves as firefighters” (p. 55), and (3) “A job you couldn’t get your hands around”” (p. 55).

Theme 2 – Relationship changes: Personal relationships, interaction dynamics and engineer perceptions of you have changed. Hill discussed this theme in terms of “reclaiming formal authority” (p. 68-71). Here is a helpful quote: “Building effective
relationships with their subordinates was unequivocally the most difficult task the new managers faced” (p. 93).

Experience 2.1: On a different organizational level: no longer “one of the guys”, instead perceived as ‘one of them’, the enemy. Hill used the term “isolation” (p. 194). The following quote from Hill (1993) was very similar to those from the managers in this study: “Not only was I no longer one of the gang, I was the enemy” (p. 70).

Theme 3 – Delegation: the challenge of leaving the hands on technical behind and learning to work through others. Hill talked about “delegation and control: the new-manager nemesis” (p. 147). Two quotes demonstrate the part delegation had for the managers in Hill’s (1993) study: (1) “Learning to delegate was perhaps the most difficult challenge the managers faced in managing subordinates’ performance” (p. 147), and (2) “delegating, which most identified as ‘the hardest part of the transition’” (p. 147).

Theme 4 – Increased stress and pressure associated with increased responsibility. Chapter seven in Hill (1993) was “Coping with the stresses and emotions” (p. 187). This chapter presented the same concepts as Theme 4.

Theme 5 – Developing new skills: discovered the need for a new set of skills as a manager. Hill (1993) presented the concept as follows: “Managers can be thought of as novices trying to practice the delicate craft of managing people without the benefit of an apprenticeship” (p. 94).

Experience 5.3: Discovered the need for better communication skills. Hill (1993) discussed the same concept in the following quote: “Communication skills were vital” (p. 108).
Theme 6 – Resources and getting the work done: finding the time, the staff and other resources to get it done. Hill (1993) had no apparent links for this theme. The view of the researcher was that this could indicate a different between the engineering function and the sales function within organizations. Further research into this is suggested in the recommendations section later in this chapter.

Theme 7 – The new guy in management: change from being a technical expert to being new in management and having a lot to learn. Hill indirectly discussed this concept. The following quote is illustrative: “Taken off the top of the heap and put on the bottom of another heap” (p. 195).

Theme 8– Organizational issues: In a new organizational level with its associated issues. Hill (1993) had no apparently links with this theme. Two of the managers in the study did not rank Theme 8 as a challenge. The three managers who did consider it a challenge ranked it low in the level of difficulty. In the researcher’s view, the lack of overlap with Hill’s (1993) study for this theme suggested three possibilities. The first possible explanation was that in the engineering function, the move from engineer to manager had different organizational issues than the sales function. The second possible explanation was that Theme 8 might not represent sufficient difficulty to be worth considering. The third possibility was that Hill’s (1993) study, which was sponsored by the organizations studied, may have overlooked that element of the transition. The researcher, or the participants, may have consciously or subconsciously not discussed the organizational issues.

Experience 9.2: It’s different from what I expected. The concept of expectations was also identified as a meta-theme in this study. Chapter 2 in Hill (1993) was titled:
“Reconciling expectations” (p. 51). The dedication of a chapter to expectations by Hill (1993), and the fact that expectations were a meta-theme in this study, suggest that expectations were an important element in the transition.

These references and quotes show definite similarities in the experiences of the different new manager groups. The data just presented suggest that the experiences of new engineering managers may not be that different from the experiences of new managers in some other fields. However, further research will be needed to test this or to discover the unique aspects of different fields. The similarity in the findings also supported the validity of the study.

Summary of Research Question 2

This section discusses conclusions relative to research question 2. First, common experiences are presented, followed by the themes and how they represent and present the experiences, finishing with a comparison between the experiences and themes from this study, with the results presented in Hill (1993). Now we will turn our attention to research question 3.

Discussion of Research Question 3

What did engineering managers find most challenging or difficult about the transition from engineer to engineering manager?

This section contains a discussion of conclusions for research question 3. The section begins with a discussion of why the identification of what is most challenging was important. This is followed by the presentation of the three most challenging aspects of the transition for the managers in the study. Next, all the themes are presented in order
of difficulty and the implications are discussed. This is followed by a short comparison with the difficulties identified by other literature sources. The section ends with a word about what was not difficult about the transition.

Understanding what engineering managers find the most difficult about the transition was important. This knowledge was essential for individuals and companies seeking to improve the transition experience. A clear understanding of what was challenging should provide the basis for building interventions, training, and support for engineers entering or in the transition. It also should provide a valuable foundation upon which further research can be developed. Now the three most challenging themes are presented and discussed.

Three Primary Challenges

Three of the themes stood out as the most challenging aspects of the transition. These were selected for special mention for two primary reasons. First, each was selected by at least one manager as the most challenging aspect. Second, four of the five managers identified these three as the top three most challenging themes. This does not suggest that other themes were not also difficult. But as the data showed, and in the view of the researcher, the three themes listed below stand out as the items the managers found most challenging about the transition from engineer to manager. Table 18 presents the top three themes. It also provides the number of managers who identified the theme as most difficult. Since the data from the interviews and the follow-up interview had different rankings for one manager, both are provided along with the average ranking value.
### Table 18

*Most Difficult Themes: Selection by Managers and Average Ranking*

<table>
<thead>
<tr>
<th>Experience Categories</th>
<th>Managers selection as most difficult</th>
<th>Average Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Theme 1</strong> So much going on: The engineering manager role involves balancing many more responsibilities, tasks and priorities than the engineering role</td>
<td>2/5</td>
<td>3/5</td>
</tr>
<tr>
<td><strong>Theme 2</strong> Relationship changes: Personal relationships, interaction dynamics and engineer perceptions of you have changed</td>
<td>2/5</td>
<td>1/5</td>
</tr>
<tr>
<td><strong>Theme 3</strong> Delegation: The challenge of leaving the hands on technical behind and learning to work through others</td>
<td>1/5</td>
<td>1/5</td>
</tr>
</tbody>
</table>

Note. Ron changed from Theme 2 in the interview to Theme 1 in the follow-up.

In the researcher’s view, Theme 1 was a challenge because it reflected a major shift in the job duties of the individual. The nature of the job changed. As an engineer, the participant generally had a very clear focus: to complete one or more technical tasks or components. It was a very technical, hands-on assignment with a tangible result. As an engineering manager the participant moved into a role where many things needed attention. The manager had to balance multiple competing demands, make quick decisions about when to stop working on one thing and focus on a new issue that had just
popped up. The results were no longer a tangible product the participant designed. These two roles had very different daily duties associated with them.

The researcher believes that Theme 2 was challenging for a very different reason. The engineering managers had spent significant time as engineers. They had relationships and peer associations with the other engineers. With the transition to manager, they were no longer peers. The social dynamics of the manager to subordinate relationship caused the personal relationships to change, in some cases dramatically. The managers found themselves outside the peer circle. They had to make decisions that had an impact on former peers. This type of change was very personal and unique for each individual. However, as a group the managers identified this as one of the most challenging things about the transition.

Theme 3 represented the challenge of leaving behind the technical and delegating the work to others. For an average of almost 18 years the managers had done hands-on technical work. Their comments, and the fact that they were promoted, indicated that they were good at technical work. With the transition to engineering manager, they had to step back from the technical work into the new realm of working through other people. As with Theme 1, this was a significant change in job duties. Some managers indicated that as they struggled with the new responsibilities and challenges of being a manager, they wanted to jump back into the technical area, to their comfort zone. The challenge of Theme 3 appeared to be two closely related items. The first was that the technical work was being replaced. The second aspect was learning to work through others. These aspects combined to make Theme 3 one of the most challenging aspects of the transition.
Each of the themes just discussed would be difficult alone—taken together and combined with those discussed in the next section, it becomes clear why the transition from engineer to engineering manager has been considered difficult. Now all of the themes are considered and ordered according to their difficulty.

**Difficulty of Themes Ranked**

This section reviews the difficulty of the themes as ranked by the engineering managers. Table 19 shows the average ranking and the standard deviation.
Table 19

*Themes Ranked by Order of Difficulty*

<table>
<thead>
<tr>
<th>Theme</th>
<th>Avg.</th>
<th>Range</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. So much going on: The engineering manager role involves</td>
<td>1.6</td>
<td>1 - 3</td>
<td>0.9</td>
</tr>
<tr>
<td>balancing many more responsibilities, tasks and priorities than the</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>engineering role.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Relationship changes: Personal relationships, interaction</td>
<td>2.4</td>
<td>1 - 5</td>
<td>1.5</td>
</tr>
<tr>
<td>dynamics and engineer perceptions of you have changed.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Delegation: The challenge of leaving the hands on technical</td>
<td>3.2</td>
<td>1 - 6</td>
<td>1.8</td>
</tr>
<tr>
<td>behind and learning to work through others</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Increased stress and pressure associated with increased</td>
<td>4.4</td>
<td>2 - 7</td>
<td>1.8</td>
</tr>
<tr>
<td>responsibility</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Developing new skills: Discovered the need for a new set of skills</td>
<td>5.6</td>
<td>4 - 8</td>
<td>1.5</td>
</tr>
<tr>
<td>as a manager</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Resources and getting the work done: Finding the time, the staff</td>
<td>5.8</td>
<td>4 - 7</td>
<td>1.6</td>
</tr>
<tr>
<td>and other resources to get it done</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. The new guy in management: Change from being a technical</td>
<td>6</td>
<td>3 - 8</td>
<td>2.1</td>
</tr>
<tr>
<td>expert to being new in management and having a lot to learn</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Organizational issues: In a new organizational level with its</td>
<td>8.2</td>
<td>6 - *</td>
<td>1.8</td>
</tr>
<tr>
<td>associated issues</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Choosing the management career path: The concerns before</td>
<td>9.2</td>
<td>6 - *</td>
<td>1.8</td>
</tr>
<tr>
<td>deciding and questions experienced during or after the transition</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* * indicates that the manager did not choose to rank the theme as difficult. For the purpose of creating the average and standard deviation, a non-ranked theme was assigned the value of ten.

One useful way of considering Table 19 was to break the themes into three groups. The first grouping includes the first three themes. The second grouping includes
themes three to seven. The third grouping includes themes eight and nine. Group one was previously discussed as the most difficult themes. The other two groups will now be explained.

The second grouping consisted of themes regarded by the managers as difficult but not ranked as the most difficult. In the researcher’s view, this group could be referred to as common challenges faced. These are things the managers experienced and found difficult, but the difficulty level was less significant than was the case for those in the first group.

The third grouping consists of themes that some managers did not find difficult. The managers indicated that they experienced the aspect of the transition represented by the theme but it did not warrant the description of difficult. For Theme 8, two managers indicated that it was not difficult: the remaining three considered it difficult. Theme 9 was identified by four managers as not difficult, and by one manager as difficult. The researcher considered the third group of themes to be things the managers experienced, but which may or may not have been difficult. Viewing the themes in this way facilitates classifying the theme groupings as follows:

Themes 1-3: Primary Challenges
Themes 4-7: Secondary Challenges
Themes 8-9: Possible Challenges

This classification approach helps focus attention on the relative difficulty of the themes. This classification will be referred to in the recommendations section.
Comparison with Badawy (1995) and Hood (1990) Lists of Challenges

Both Badawy (1995) and Hood (1990) presented lists of difficulties in the transition from engineer to manager. The complete lists were included in chapter 2. Below is a comparison of how the lists overlap with the findings of this study.
### Table 20

**Difficulty Overlap Comparison to Badawy (1995) and Hood (1990)**

<table>
<thead>
<tr>
<th>Difficulty</th>
<th>Corresponding Theme/Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Badawy (1995, p. 27)</td>
<td></td>
</tr>
<tr>
<td>3. Determining priorities</td>
<td>So Much Going On (Theme 1)</td>
</tr>
<tr>
<td>5. Doing things myself that I could delegate</td>
<td>Delegation (Theme 3)</td>
</tr>
<tr>
<td>6. Putting out brush fires</td>
<td>So Much Going On (Theme 1)</td>
</tr>
<tr>
<td>7. Determining optimum degree of help to give to individuals</td>
<td>Delegation (Theme 3)</td>
</tr>
<tr>
<td>8. Dealing with excessive secondary demands on my time; paperwork; inconclusive meetings</td>
<td>So Much Going On (Theme 1)</td>
</tr>
<tr>
<td>9. Dealing with manpower shortages</td>
<td>Resources (Theme 6)</td>
</tr>
<tr>
<td>10. Maintaining my own knowledge in fields supervised</td>
<td>New Knowledge (Experience 7.3)</td>
</tr>
<tr>
<td>11. Gaining time to test a product properly before it is sold</td>
<td>Resources (Theme 6)</td>
</tr>
<tr>
<td>Hood (1990,)</td>
<td></td>
</tr>
<tr>
<td>1) Delegating appropriately</td>
<td>Delegation (Theme 3)</td>
</tr>
<tr>
<td>2) Ability to communicate skillfully</td>
<td>Communication Skills (Experience 5.3)</td>
</tr>
<tr>
<td>3) Directing and guiding others</td>
<td>Delegation (Theme 3)</td>
</tr>
<tr>
<td>8) Balancing quality and perfection with time and resource constraints</td>
<td>So Much Going On (Theme 1)</td>
</tr>
<tr>
<td></td>
<td>Resources (Theme 6)</td>
</tr>
</tbody>
</table>

Table 20 contains two perspectives to consider. One view was to question why only about half of the items overlapped. The second view was to point out that half of the items did overlap. The researcher’s view of this comparison included the following three
aspects. First, the full lists from both the sources suggested a focus on task-related difficulties in the manager position, rather than the focus on what the individual personally found challenging. The complete absence of Theme 2, regarding relationships, supported this view. The managers in this study identified this as one of the primary challenges. In addition, the managers in Hill’s (1993) study also identified relationships as a challenge. The absence of the relationship dynamic in both sources in Table 20 suggested a task, rather than a personal, focus. The second aspect is that the source of the results from Badawy (1995) and Hood (1990) did not align with this study. Hood (1990) used a survey to collect the data. Badawy (1995) did not provide the source of the list presented. On the other hand, the results from this study were based on the experiences of the managers as identified during interviews. In the researcher’s view, the differences in the source of the data could easily lead to differences. The third perspective was based on the two aspects of the comparison just presented. It seemed reasonable for the overlap to show the results seen above. In the view of the researcher, the overlap depicted in Table 20 further supported the findings.

Administrative Aspects were Easy.

In the researcher’s opinion, it was important to identify something the managers in the study did not indicate as difficult. Based on the data gathered from the managers, the administrative aspects of the managerial job were not considered difficult. The administrative aspects mentioned include budgeting man-hours, creating a project plan and timeline, and other related tasks. The managers experienced the need to do these things, but they did not find them difficult or challenging. There were some administrative tasks
the managers needed to learn, such as preparing an agenda and running effective meetings, but most administrative things were discussed by the managers as not challenging.

**Summary of Research Question 3**

This section presents conclusions for research question 3. The three primary challenges were presented and discussed. The relative difficulty of all the themes, as ranked by the managers, was shown. A comparison with other difficulty lists was provided. And a brief discussion of what was not difficult concluded this section.

**Summary of Conclusions**

This section presented conclusions for the three research questions. The data in chapter 4 provided the input and basis from which the conclusions were drawn. In some cases these data were compared to other sources. The discussion of the conclusions was organized around each research question. Now the recommendations are presented.

**Recommendations**

Recommendations are presented in this section for various groups. The recommendations are based on the data from chapter 4 and the conclusions presented in the previous section. The groups for which recommendations are offered include: academics preparing engineers for management, academics and future research, engineers interested in management, human resource professionals, and managers who promote engineers.
Recommendations for Academics Preparing Engineers for Management

The findings of this study contained insights for academics who are involved in preparing engineers to be managers. These could be included a formal MBA or Engineering / Technology Management program, a single course, workshops, or lectures. Engineering management is much different than engineering. Following are the recommendations:

1. Theme 5 identifies three specific skill areas. The managers indicated that they felt they needed better skills in these areas. Theme 1 implies that certain skills would be valuable, and Theme 3 also suggests some specific skills. The skills from these three areas are included below.

   a. People skills: Specifically, elements like team building, motivation and theories regarding what motivates individuals, and getting buy-in from others.

   b. Administrative skills: This included things such as preparing an agenda, running an efficient meeting, and using software planning tools.

   c. Communication skills: Primarily verbal communication skills for presentations and being the spokesperson representing the company.

   d. Time management skills: With so much more happening as a manager, the engineer needs to be more organized and be able to manage time more effectively.

   e. Prioritization skills: Methods of identifying what matters most and staying focused on key tasks should assist the new manager in getting the most important things accomplished.
f. Delegation skills: Since the manager role requires the manager to work through others, delegation skills will be important.

2. An understanding of what other engineering managers have found difficult should help prepare the new manager for what they may face and help them make the mindset change from doing themselves to doing through others. Introduce the managers-to-be to the potential challenges of the transition they are moving toward.

**Recommendations for Academics and Future Research**

This study revealed a variety of areas or topics that need additional examination. Following are recommendations to academic researchers for further investigation.

1. Replicate this study. It can be done on other segments of the engineering workforce in other industries. Or it could be on the same industry but in a different geographic area. Or it could target high growth companies where much less time is spent as an engineer prior to transitioning into management. The results can be compared to the results to this study. This will broaden the base and further support efforts to get generalizable results.

2. Use the findings of this study as the basis for further research to create instruments, such as a survey, to include larger samples and create generalizable results. This could be done in conjunction with a society of engineers or engineering managers.
3. Conduct a detailed study, focused on the nature of the period when both engineering and managerial work is being done. The data from this study suggested that this part of the transition was a very important period. This period was not examined in this study with enough detail to really provide a good understanding of the dual-role period and whether it plays a pivotal part in the transition process.

4. Related to the previous item was an examination of the dual-role period in terms of the concept of ‘sink or swim.’ Aspects of this phase include: (1) How many who start this phase continue into management?; (2) how many go back to being just technical?; and (3) how many (if any) linger in a role with a little managerial work, but primarily still hands on technical. This ‘sink or swim’ test period may be a way in which companies and individuals both test out the management career path. More investigation is needed into understanding this potentially important decision point in the career path of engineers and/or engineering managers.

5. Compare the experiences and challenges of engineering managers with those of other business functions. Comparison with Hill (1993) suggested that the experiences of engineering managers might have been similar to those of sales managers. Theme 6, which dealt with resources, may have been an area of challenge specific to the engineering function. Research specifically designed to compare the experiences of different business functions could highlight similarities and differences. This knowledge would allow those who train managers to provide specific customizations related to the specific group being targeted.
6. This study focused on what was difficult. The next logical question is to ask, ‘How do engineering managers overcome and deal with these challenges?’ Conduct a study that seeks to answer this question.

**Recommendations for Engineers Interested in Management**

The focus of this study was to understand the experiences and challenges of the transition. Some practical insights surfaced during the study. The recommendations for engineers interested in management or already in the transition are as follows.

1. Consider the experiences of these managers. The move into management was a significant career step. A clear understanding of the potential challenges that may lie ahead may provide guidance on how to prepare for them. In addition, simply knowing what type of potential challenges to expect may facilitate handling them when they occur.

2. Ask for training as soon as you start into the transition. Not getting help and support early on was mentioned as a problem for the managers. The people skills of motivation, getting buy-in, and team building were specifically mentioned. One manager attended a course specifically focused on the issues involved with leading and managing people. The manager took the course a few years into the transition. He indicated that it helped a lot, but wished he had taken it when the transition first started: it would have saved him a lot of frustration.

3. Some of the managers in the study indicated that early in the transition they had not asked for help since they considered it a sign of weakness (experience 7.7). During the interviews they regretted that choice. When you begin managing,
don’t hesitate to ask for help from your manager. As a new manager you need the guidance and input your manager can offer. In addition, by discussing challenges you are facing, you are more likely to get the advice or resources needed to get your job done.

*Recommendations for Human Resource Professionals*

The findings of the study demonstrate that the transition was a difficult period for the managers. The recommendations that follow suggest what companies can do to support the new managers and facilitate their transition from doers to managers.

1. Provide internal, or make available external, training needed by the engineer in transition to management. In particular, make available training on the people skills needed for managing. This should be made available to engineers. As the study demonstrated, it may be years after an engineer has started managing before the formal management title is received. If the training on people skills is only available to those with management titles it is likely to come too late to do the most good. See the section for ‘academics preparing engineers for management’ for other areas of training which should be available.

2. The engineer making the transition to manager needs the support and guidance of their manager. Encouragement, through formal processes or informal methods, should be given to the manager of new managers to provide the needed support and guidance. This could be done through regularly scheduled meetings when the new engineering manager can ask questions, and get guidance on current issues or challenges. Again, depending on how the transition process works at your
company, do not wait until the formal management title is given, especially if the transition is primarily taking place while the formal title of the new manager is still ‘engineer.’

**Recommendations for Managers who Promote Engineers**

Senior managers who are bringing the engineer into the manager role should recognize the challenges the new manager will face. Most senior managers most likely made the transition themselves at some point. The recommendations below will help facilitate the transition for the engineers. The effort involved in facilitating the successful transition of new manager should be worth the time. The faster and more effectively the new manager masters the manager role, the better for the senior manager. Here are specific suggestions to help facilitate the transition of those who are promoted.

1. Recognize the likelihood that an easier and faster transition will result in the manager-to-be being fully productive sooner.

2. The period early in the transition is important, especially if both engineering and managerial roles are being handled. Encourage the manager-to-be to attend training in people skills and the other items discussed in the ‘academics preparing engineers for management’ recommendations above as they start to increase in management responsibility.

3. Give the manager-to-be regularly scheduled time to ask questions and seek advice. This time does not need to be lengthy but should be regular. Encourage early identification of any problems by the manager-to-be so that assistance can
be provided and allow the manager-to-be to solve it before the situation becomes critical.

4. Be familiar with the challenges and discuss them with the manager-to-be, particularly the primary challenges. Awareness of what may lie ahead should prepare the manager-to-be.

Chapter Summary

This chapter presented an overview of the study. Conclusions based on the data from chapter 4 were provided for each of the research questions. This was followed by recommendations for various groups, which were developed in light of the findings and conclusions of the study.

Study Summary

The purpose of this study was to examine the transition from engineer to engineering manager in order to understand the experiences and challenges faced by the managers who made the transition. Literature relevant to this topic was presented and discussed. The study was a qualitative interview study, based in the tradition of phenomenology. Five engineering managers in aerospace companies on Long Island, New York were interviewed for 75-90 minutes on three occasions. These interviews were recorded and transcribed to provide the raw data for the study. These data were analyzed and organized. Forty-five experiences were identified and nine themes were created to represent the experiences. The results demonstrated that the transition was difficult for the managers. The three main aspects the managers found difficult were that there was so much going on, the relationship changes, and working through others. The need for
further research of various aspects of the transition was discussed and recommendations to various groups were offered as a result of study findings.
REFERENCES


APPENDIX A

Instruments
Participant Selection Guide

Criteria

• Must have started as an engineer (at least 5 yrs as engineer) and then transitioned from engineer into an engineering manager role

• Must not have pursued business degrees prior to the transition into management

• Must have transitioned to manager in the last 1-5 years

• Must work for an Aerospace company on Long Island New York..

1. Do you have an electrical engineering, computer engineering, computer science, aerospace engineering or related technical degree? If so, what is your degree? [answer sought: yes]

2. Did you pursue a business degree or related degree prior to starting the transition to engineering manager? [answer sought: no]

3. Did you move from working as an engineer to working as a manager? [answer sought: yes]

   (a) If yes, what % of time spent doing … (read manager duties) and what % spent doing (read engineering duties)? [answer sought: must be clearly over 50% to be considered]

   (b) How many years as an Engineer? [answer sought: must be at least 5 years]

4. When did you make the change to doing more than 50% managerial duties? (may need to explain this) [answer sought: in range of 1-5 years]

5. Do you work for a computer hardware or software company on Long Island New York? [answer sought: yes]
Informed Consent Form


Purpose of the Study

This study examines the transition from engineer to manager. The researcher is trying to answer the following questions:

What is the nature of the transition from engineer to engineering manager for engineering managers involved in the study?

What are common experiences for engineers who transition to engineering manager?

What did engineering managers find most challenging or difficult about the transition from engineer to engineering manager?

As a participant you will gain a better understanding of your own transition and a record of your thoughts on the transition with your copy of the transcribed interviews. The engineering community will benefit from the study through a better understanding of the challenges faced by engineers who make the transition. This may lead to better practices to assist engineers in the transition.

Participant involvement in the Process

As a participant in this study you will be involved in approximately four - five hours of interview. This will be broken into three 1-½ hour interviews. The interviews will take place at a location decided upon with the researcher. Each interview needs to occur within one to two weeks from the previous interview. During the interviews you will be asked to share your experiences related to the research questions listed above. The interviews will be recorded on audiocassette and transcribed verbatim. A copy of the transcribed interviews will be provided to you so that you can review the transcription to ensure that it captures the essence of what you had to say. The audiocassette recording of the interview will be destroyed after you confirm the accuracy of the transcription. Combining the interview time and the review of transcriptions, your involvement will require between five and seven hours depending on the time required for reviewing the transcriptions.

Your involvement in this study is voluntary and you may decline to answer any specific question and may withdraw from the study at any time. Please consult with the researcher before the interviewing begins if you have any questions or concerns regarding involvement in this study.
Confidentiality

The audiocassette recordings and transcriptions will be stored safely. Your identity as a participant will only be known to the researcher, yourself, and the transcriber. The research results will provide confidentiality through the use a fictitious name when presenting the findings and the removal of identifying material in the transcription. With these measures for confidentiality there should be no potential risks for you in this study.

Researcher

The researcher is pursuing a Ph.D. at The Pennsylvania State University. The researchers doctoral committee is overseeing this study. The researcher information is as follows:

Chris Allen Howard  
Ph.D. Candidate, The Pennsylvania State University  
(631) 874-5737  
cah206@psu.edu

Thank you for your involvement in this study.

I certify that I have reviewed and understand the preceding information regarding my voluntary involvement in this research study.

Name: ____________________________ Date: ____/____/_______

I, the undersigned, have defined and explained the study involved to the above volunteer.

Name: ____________________________ Date: ____/____/_______
Interview Guide

Interview 1

The purposes of this interview are as follows:

- Allow the participant to discuss their transition in a very open format. It is intended to help them relive the transition and get them thinking about it. This will enhance the accuracy and value of answers to later questions.
- Understand what the participant thinks of the transition and what things come to mind first. Later interviews are more directed, this interview is more open and is intended to allow them to discuss what they think worthwhile or memorable about the transition.
- Establish rapport with the participant.
- Ask questions related to research question three.

1. Tell me about your current job responsibilities. What are you responsible for and what activities are you involved in at work?
   a. Given the activities you have mentioned, what percentage of your time is spent in each activity?
   b. How many people report to you? Has that number changed over time and if so, how?

2. Tell me about how your career has progressed. Begin with when you began as an engineer and progress up to the present. What steps or phases were involved, what were your responsibilities during each step or phase, and how long each lasted.
   a. How would you describe or label each of the steps or phases?

3. What do you consider to be the transition from engineer to engineering manager? When did it occur for you and how would you define the transition?
Interview 2

The purpose of this interview is to

• Pick up where the last interview left off if we were unable to complete that discussion.
• Review the discussion from interview 1 and probe in areas deemed important to answering research question three.
• Ask questions related to research question one and two.

1. Reflect back on your transition from engineer to engineering manager. What are the first things that come to mind?
   a. Please recount to me what happened during the transition and describe what you were doing, what you were thinking, and what you were feeling during the chain of events leading from engineer to engineering manager.

2. You probably had some expectations regarding what you thought it would be like to be an engineering manager. What things are different from what you expected? What things are as you expected?

3. What did you like and dislike about being an engineer? What things do you like and dislike about being an engineering manager?

4. What did you like about the transition? What did you dislike about the transition? Why?
Interview 3

The purpose of this interview is to

• Pick up where the last interview left off if we were unable to complete that discussion.
• Review the discussion from interview 2 and probe in areas deemed important.
• Use critical incident questions to help answer questions one and two.

1. Think about the most common or typical difficulties or challenges you faced in the transition from engineer to engineering manager. These can be anything about the transition you found difficult or did not like. These can be things you expected or were surprised by during the transition. Please provide details such as what the difficulty was, what the situation was, how you felt, who was involved, if anyone.

2. Think back to the single most difficult thing about your transition from engineer to engineering manager. It may have been something you found challenging, a barrier you faced or a situation or experience you had. It could be a single event or perhaps a new responsibility that was particularly difficult to adjust to. Please provide as much detail as you can regarding this single most difficult thing about your transition.

3. As you considered the single most difficult thing, what other things came to mind that we did not discuss?

4. What would your closest friend or confidant say was the most difficult about your transition?

5. What things were not difficult about the transition?
Transcription Confidentiality Agreement

The message below is the message presented to the subjects in the study regarding confidentiality.

Confidentiality

The audiocassette recordings and transcriptions will be stored safely. Your identity as a participant will only be known to the researcher, yourself, and the transcriber. The research results will provide confidentiality through the use of a fictitious name when presenting the findings and the removal of identifying material in the transcription. With these measures for confidentiality there should be no potential risks for you in this study.

I recognize the confidential and potentially personal nature of the interviews I will be transcribing. I agree to maintain the confidentiality of the participants.

The original copy of the transcriptions that I create will include the actual names of the interviewer and any individuals they refer to during the interviews. It will be the responsibility of Mr. Howard to remove the identifying material and replace subject names with fictitious identifiers.

During the time that I have possession of the audiocassettes I will not leave them unattended in a place which others may have access to.

In the unlikely event that I know one of the interview subjects I will inform Mr. Howard and will not transcribe the interviews of this individual.

I agree to only keep a copy of the transcription until the researcher, Mr. C. Allen Howard, has verified that he has made backup. After this time I will destroy any copies, electronic or otherwise, which I have.

I, the undersigned, have read and agree to the discussion above.

Name: _______________________________ Date: ___/___/_______

I, the undersigned, have discussed the transcription confidentiality requirements with the transcriber.

Name: _______________________________ Date: ___/___/_______
APPENDIX B

Themes and Experiences of Engineering Managers in the Transition
Themes and Experiences of Engineering Managers in the Transition

<table>
<thead>
<tr>
<th>Theme 1 – So much going on: The engineering manager role involves balancing many more responsibilities, tasks and priorities than the engineering role.</th>
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</thead>
<tbody>
<tr>
<td><strong>Experience 1.1:</strong> Change from a primarily single focus engineer role to a broader, multiple focus managerial role</td>
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<tr>
<td><strong>Experience 1.2:</strong> Required to balance and prioritize many tasks and roles</td>
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<tr>
<td><strong>Experience 1.3:</strong> Interruptions frequently occur and require you to drop what you are doing and respond immediately</td>
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<td><strong>Experience 1.4:</strong> Meetings demand much of your time</td>
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<td><strong>Experience 1.5:</strong> Difficult to maintain two distinct roles during transition: Working as an engineer and as a manager</td>
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<td><strong>Experience 1.6:</strong> Am I doing the job right? Proving your worth and staying ‘on top of things’ when the unexpected occurs</td>
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<tr>
<th>Theme 2 – Relationship changes: Personal relationships, interaction dynamics and engineer perceptions of you have changed.</th>
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<tbody>
<tr>
<td><strong>Experience 2.1:</strong> On a different organizational level: No longer “one of the guys”, instead perceived as ‘one of them’, the enemy</td>
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<tr>
<td><strong>Experience 2.2:</strong> Resentment or jealousy by some engineers that you were promoted instead of them</td>
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<tr>
<th>Title</th>
<th>Manager</th>
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<td></td>
<td>Don</td>
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<tr>
<td>Theme 1</td>
<td>✓</td>
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<tr>
<td>Experience 1.1</td>
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<td>Experience 1.2</td>
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<td>Experience 1.6</td>
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<td>Theme 2</td>
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<td>Experience 2.1</td>
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<tr>
<td>Experience 2.2</td>
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</tbody>
</table>
Experience 2.3: Engineers trying to take advantage of friendship with you
Experience 2.4: It is tough to discipline former peer / engineer
Experience 2.5: Need to be careful about what you say to the engineers
Experience 2.6: Getting the respect you feel you need to do your job
Experience 2.7: It is difficult to lay off engineers who you know personally
Experience 2.8: Evaluating your former peers: Knowing the potential impact on their career
Experience 2.9: The relationship side of delegation: Occasionally need to assign mundane or ‘dog work’ to prior peer
Experience 2.10: Losing trust and credibility: Letting people down who rely on you for technical work

Theme 3 – Delegation: The challenge of leaving the hands on technical behind and learning to work through others.
Experience 3.1: Working through others: A mindset change from ‘doing’ to ‘managing’
Experience 3.2: Enjoyed the technical work and miss the satisfaction of doing the hands-on work
Experience 3.3: Letting engineers do their own design: Overcoming the feeling that ‘my way is better’ or ‘I’d get it done faster’
Experience 3.4: Wanted to control everything, but learned that you can’t

Theme 4 – Increased stress and pressure associated
with increased responsibility.

**Experience 4.1: Increased responsibility: Ownership of** something much larger and impact of decisions increased

**Experience 4.2: More pressure and stress**

**Theme 5 – Developing new skills: Discovered the need for a new set of skills as a manager.**

**Experience 5.1: Need better people skills: As a manager a new set of people skills are required**

**Experience 5.2: New administrative skills: Had to run meetings, prepare agendas and use new software tools**

**Experience 5.3: Discovered the need for better communication skills**

**Theme 6 – Resources and getting the work done:**
Finding the time, the staff and other resources to get it done.

**Experience 6.1: Working more hours as a manager**

**Experience 6.2: Difficulty getting the resources to do the job**

**Experience 6.3: Trade-offs: Can’t do everything 100%, must make judgment calls**

**Experience 6.4: Did not have the authority expected**

**Experience 6.5: Downsizing: Difficult to see your organization go ‘down the tubes’ due to outside forces**

**Theme 7 – The new guy in management: Change from being a technical expert to being new in management and having a lot to learn.**

**Experience 7.1: Feeling like a novice: As a new manager you have a lot to learn**

**Experience 7.2: Those with a lack of mentoring found**
it tough: Having good organizational support around you is important

Experience 7.3: No formal training or preparation: Felt unprepared for the manager role ✓ ✓ ✓ ✓

Experience 7.4: Desire and attempt to show management how to manage, to get them in touch with the engineer issues ✓ ✓ ✓

Experience 7.5: Managing outside your area of expertise: Had to quickly develop new domain knowledge ✓ ✓ ✓

Experience 7.6: Perceived as a novice: Being treated like the novice by others ✓ ✓

Experience 7.7: Difficult asking for help: Considered it a sign of weakness ✓ ✓

Theme 8 – Organizational issues: In a new organizational level with its associated issues.

Experience 8.1: Had to deal to a greater extent with office politics ✓ ✓

Experience 8.2: Being in the middle: You’re often between management and engineers or between management and customer ✓ ✓

Experience 8.3: Ethical decisions are more important as a manager ✓ ✓

Experience 8.4: Difficult person to deal with:

Personnel Issue

Experience 8.5: ‘No recourse for protecting yourself in a management role’ 1/5 ✓

Theme 9 – Choosing the management career path: The concerns before deciding and questions experienced during or after the transition.
| Experience 9.1: Making the decision: Motivation and questions or concerns about going into management | ✓ | ✓ | ✓ | ✓ |
|Experience 9.2: Its different from what I expected | ✓ | ✓ |

*Note.* Check indicates the manager is associated with this experience, based on the interviews.
Chris Allen Howard was born and raised in Idaho by Terrill and Charlotte Howard. Following high school graduation in 1985, he attended Brigham Young University (BYU), initially studying business and later switching to engineering. While in school he took time to enrich his educational experience by working for the National Security Agency as a junior engineer. He received a Bachelor of Science degree in Electrical and Computer Engineering from BYU in December 1993.